Housing Costs, Zoning, and Access to High-Scoring Schools

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"Limiting the development of inexpensive housing in affluent neighborhoods and jurisdictions fuels economic and racial segregation and contributes to significant differences in school performance across the metropolitan landscape."

Findings

An analysis of national and metropolitan data on public school populations and state standardized test scores for 84,077 schools in 2010 and 2011 reveals that:

- **Nationwide, the average low-income student attends a school that scores at the 42nd percentile on state exams, while the average middle/high-income student attends a school that scores at the 61st percentile on state exams.** This *school* test-score gap is even wider between black and Latino students and white students. There is increasingly strong evidence—from this report and other studies—that low-income students benefit from attending higher-scoring schools.

- **Northeastern metro areas with relatively high levels of economic segregation exhibit the highest school test-score gaps between low-income students and other students.** Controlling for regional factors such as size, income inequality, and racial/ethnic diversity associated with school test-score gaps, Southern metro areas such as Washington and Raleigh, and Western metros like Portland and Seattle, stand out for having smaller-than-expected test-score gaps between schools attended by low-income and middle/high-income students.

- **Across the 100 largest metropolitan areas, housing costs an average of 2.4 times as much, or nearly $11,000 more per year, near a high-scoring public school than near a low-scoring public school.** This *housing cost gap* reflects that home values are $205,000 higher on average in the neighborhoods of high-scoring versus low-scoring schools. Near high-scoring schools, typical homes have 1.5 additional rooms and the share of housing units that are rented is roughly 30 percentage points lower than in neighborhoods near low-scoring schools.

- **Large metro areas with the least restrictive zoning have housing cost gaps that are 40 to 63 percentage points lower than metro areas with the most exclusionary zoning.** Eliminating exclusionary zoning in a metro area would, by reducing its housing cost gap, lower its school test-score gap by an estimated 4 to 7 percentiles—a significant share of the observed gap between schools serving the average low-income versus middle/higher-income student.

As the nation grapples with the growing gap between rich and poor and an economy increasingly reliant on formal education, public policies should address housing market regulations that prohibit all but the very affluent from enrolling their children in high-scoring public schools in order to promote individual social mobility and broader economic security.

Introduction

Education is enormously important to human welfare. At the individual level, education leads to higher incomes, better labor market performance, higher social status, increased participation in civil society, and better health.[1] These benefits cannot be reduced to genetic advantages. Given a set of identical twins, the twin that acquires more education earns significantly higher income.[2] Likewise, people that accidentally receive more education—because of the timing of their birth or proximity to educational institutions—also earn higher wages, and the wage premium for education is roughly equal across racial groups.[3]

Education is also increasingly recognized as a key contributor to regional and national prosperity. Researchers find that human capital—measured by education—is the cause of historic economic development, higher living standards over any period, and a more vibrant and trustworthy civil society.[4]

Despite its importance, huge inequalities in educational attainment persist across income and racial/ethnic groups. Blacks aged 25 and older are twice as likely, and Hispanics four times as likely, as whites to have not completed high school.[5] Post-secondary degree attainment rates are also much higher for whites than these groups. At the same time, the academic achievement gap between rich and poor is growing.[6] The majority of high school dropouts—60 percent—come from the bottom 20 percent of families by income.[7] Moreover, only 5 percent of students enrolled in the most competitive universities come from the bottom quintile of parental socio-economic status, while 70 percent come from the top quintile.[8]

These statistics are troubling enough in terms of what they imply about equality of opportunity in the United States, but they also signal immense damage to the nation's economic vibrancy. When large numbers of students are not educated up to their potential, it drains the pool of potential inventors, researchers, civic leaders, and skilled laborers that would otherwise nurture innovation and economic prosperity.

With these challenges in mind, policy leaders have taken a number of steps over the past few decades to expand access to high-quality education for disadvantaged groups. These reforms have included efforts to equalize school funding, largely by increasing the share of financing provided by federal and state governments. In big cities, an increasing number of reform-oriented mayors are wresting control of school administration from school boards and unions. Charter schools and vouchers programs have proliferated in some states with the goal of providing children with alternatives to the poor-performing neighborhood schools to which they would be otherwise assigned. Several policies and programs like merit pay and Teach for America aim to improve low-performing schools by attracting more talented teachers to those environments.

While all of these efforts deserve careful consideration, none directly addresses one of the central issues that limit educational opportunity for low-income and minority children: their disproportionate concentration in low-performing schools. In particular, limiting the development of inexpensive housing in affluent neighborhoods and jurisdictions fuels economic and racial segregation and contributes to significant differences in school performance across the metropolitan landscape.

While the connections between the real estate market and school performance have been widely studied, this is the first nationwide report to estimate the actual costs associated with living near a given public school. Likewise, while zoning has been studied intensely, this is the first national report to link zoning data with school test score data.

This paper proceeds as follows. The first section surveys academic research on educational achievement with an emphasis on the relative effects of schools and families in shaping educational outcomes. A methodology section provides a summary of data sources and defines the main variables measured. The paper then examines differences in school test score performance among different racial/ethnic/income groups, how these differences vary across metropolitan areas, and implications for educational outcomes. Subsequent findings explore potential explanations for school inequality, including large gaps in housing costs, which are correlated with exclusionary zoning laws. The paper concludes with a brief discussion of public policy implications.

Background

The importance of high-quality schools in the context of family socioeconomic status

Empirical research on intergroup disparities in test score performance rejects simple genetic explanations and points to large differences in environmental quality.[9] These environmental differences could take many forms, with access to high quality education being just one important factor. For example, much of a child's education takes place outside the classroom through interactions with family members and neighbors. The social science literature has not reached a consensus as to the relative importance of factors such as school quality, family, or other non-genetic variables on educational achievement.

Some education scholars find that schools only make a small difference to observable outcomes like test scores and differences in socio-economic status are more important in explaining performance gaps.[10] This was a major finding from the 1966 Coleman report, although the importance of schools was entirely rejected.[11] More recently, one study estimates that 75 percent of the early childhood black-white test score gap is the result of measurable differences in family background—such as socio-economic status and the number of books in the home.[12] One important channel may be parental educational investments: Mothers with a college education spend an average of 4.5 hours more per week with their children than mothers with no college education.[13] More educated parents are also more likely to discuss school related matters with their children and attend meetings—all of which is associated with higher student achievement.[14] Moreover, the quality of learning tends to be greater for children of more educated parents, who are exposed to thousands more unique words per hour of interaction than children of less educated parents.[15] Further evidence shows that poor children aged five and under receive less emotional support and cognitive stimulation from their mothers, who are also far more likely to exhibit symptoms of depression.[16]

Other research finds that the quality of schooling is enormously important to both test scores and future economic success. Across a large number of empirical studies economists have found that student exposure to high quality schools—measured by test scores, peer effects, and teacher quality—substantially increases the probability of economic success later in life.[17] Many studies also find that disadvantaged students do better when randomly assigned to charter schools or private schools (after winning a lottery) compared to similar students who attend traditional public schools.[18] Yet, other scholars find that attending higher-scoring schools does not itself affect test scores.[19]

Turning more specifically to racial differences, scholars have found very large and positive effects on blacks as a result of school integration.[20] Studies by Guryan and Johnson, for example, find that school desegregation policies produce large-scale generational effects in educational attainment. Along similar lines, scholars have found that some, and even all, of the racial test score gap can be eliminated when blacks attend high quality schools.[21] Likewise, in important recent work from the economists Hastings and Weinstein suggests that desegregation would have large and significant effects on student achievement.[22] Using data from Charlotte, they find that students who win admission via lottery to higher-scoring schools perform significantly better.[23]

And yet, on average, blacks and other disadvantaged groups still attend schools with the lowest test scores. In a recent report with 2004 data, John Logan finds that students from disadvantaged racial backgrounds—blacks, Hispanics, and Native Americans—attend schools that perform far worse than those attended by whites and Asians, and that residentially segregated large metropolitan areas—often in the Northeast and Midwest—tend to exhibit the most unequal schooling quality between races.[24]

Another strand in the literature explicitly links educational opportunity and success to metropolitan and neighborhood housing characteristics.[25] Card and Rothstein find that somewhere between 25 percent and 60 percent of the SAT test score gap between blacks and whites can be explained by residential segregation at the metropolitan scale.[26] Cutler and Glaeser find that segregation can account for 100 percent of the black-white gap in educational outcomes among young adults.[27] Massey finds that black and Hispanic students admitted into selective college performed much better if they grew up in racially integrated neighborhoods and concludes that segregation causes environmental stress and inadequate preparation that weakens college performance.[28]

Debate on the Experimental Evidence of Neighborhood Effects

One criticism of studies that compare minorities living in more or less integrated settings is that they might overstate the effects of neighborhood circumstances by failing to fully capture less tangible family effects—like time spent reading books to children—or personal motivation that might sort more capable families into better neighborhoods.[29]

To estimate experimental effects of neighborhoods, researchers have taken advantage of two public housing market interventions that were designed to improve living conditions for the poor. One in Chicago, called the Gautreaux program, allowed public housing residents and applicants to go on a waiting list from which they would receive a voucher to pay their rent in a suburban neighborhood that was at least 70 percent white, or a typical urban housing unit, depending on assignment from the Chicago Housing Authority.[30] Black children who grew up in families that were given the voucher for suburban, integrated, neighborhoods were far more likely to attend better schools, make friends with whites, and go on to four-year colleges.[31] The program operated from 1976 to 1998.

Other experimental research has yielded less encouraging results that nonetheless remain contested. The Moving to Opportunity (MTO) program was operated in a few cities by the Department of Housing and Urban Development in the 1990s. The approach randomly assigned public housing participants to three categories: no housing assistance, normal Section 8 voucher assistance with no geographic stipulations, and experimental housing assistance for those who move to a neighborhood with poverty rates of 10 percent or lower.

The experimental voucher group did move to neighborhoods with lower poverty rates than the control group, but researchers found no significant benefit to male youth after an average of five years and conclude by casting doubt on the importance of "neighborhood effects."[32] This interpretation has been criticized, however, because the voucher intervention resulted in only very small differences in neighborhood quality, as measured by access to high-scoring schools, exposure to middle-class families, and racial integration.[33] The MTO scholars have responded to these criticisms by looking more explicitly at the effects of neighborhood exposure to poverty over time (for five years on average) on adult incomes.[34] Other scholars found no benefits from the experimental voucher program on student test score performance, but they too found that the vouchers did little to improve the school environment.[35] Meanwhile, Wodtke and colleagues find evidence that growing up in poor neighborhoods leads to cumulative long-term harm that is unlikely to be overcome by a short-period of living in an affluent neighborhood—much less a segregated working-class neighborhood with low-scoring schools, as was the case in the MTO experiment.[36]

The relationship between schools and housing costs

Economists have found that parents are willing to pay more to live near higher-scoring schools, but there have been just a few studies that link housing costs and school opportunity to zoning or housing policies.[37] After examining data on low-income families randomly selected to live in various affordable housing projects in Montgomery County Maryland, Schwartz concludes that county government inclusionary zoning policies raise the test scores of disadvantaged students living in public housing by allowing them to live in affluent neighborhoods with higher-scoring schools.[38] A recent quasi-experimental study of a small group of low-income families living in an affluent suburban affordable housing project in New Jersey found that children spent more time reading outside of school compared to a control group, which indirectly boosted their grades.[39] In theoretical work, Hanushek and Yilmaz find that exclusionary zoning policies are likely to exacerbate inequalities in educational attainment across income groups.[40]

Finally, it is well documented that zoning increases housing prices.[41] Yet, there are no explicit studies of the effects of zoning on access to high quality education. Because of difficulties in gathering and quantifying information on zoning—which is the province of local governments—most academic work analyzes zoning data for small regions.[42] Yet, recent research has taken advantage of new survey data on zoning and concludes that anti-density zoning—restrictions that forbid or deter more affordable multi-family housing—exacerbate the segregation of households into different neighborhoods according to income and race.[43] The results of these studies suggest that changing zoning laws from the most exclusionary metropolitan areas to the least would reduce black-white residential segregation by at least 35 percent and economic segregation by over 40 percent.[44]

A Brief History of Zoning

In the decades after the Civil War, U.S. cities had almost no regulations on where housing and commercial properties could be located and how they could be used.[45] As it happens, there was also very little segregation by class, according to urban historians, and segregation by race was much lower in 1890 than in any time thereafter (even though the rights of blacks were highly restricted economically and socially).[46] In the late 19th century, regulations on housing began as a way to guard against exploitative and unhealthy tenement conditions and to protect people things like industrial pollution and noise.[47] Zoning ordinances that explicitly prohibited blacks from white neighborhoods also became common, until struck down by the Supreme Court in 1917.[48]

Meanwhile, in the late 19th and early 20th Centuries, major demographic changes were occurring in U.S. metropolitan areas. As immigrants moved into cities, affluent professionals moved into suburbs and began to set up zoning laws in the 1920s.[49] In the wake of a Supreme Court decision in favor of zoning, the number of municipalities with zoning legislation went from 368 to over 1,000 from 1925 to 1930.[50] The growth in regulation continued in subsequent decades, even as Civil Rights legislation otherwise improved housing accessibility for middle-class minorities. By 1968, 5,200 jurisdictions in metropolitan areas had zoning ordinances, and as many as 10,000 governments in total possessed land use power.[51]

Despite all this, a strong movement developed in opposition to "exclusionary" zoning. Federal court cases stuck down zoning ordinances that denied the construction of multi-family or low-income housing on dubious grounds—arguing that the discriminatory effect of these laws against blacks and the poor required that they pass strict scrutiny.[52] Scholars like Robert Babcock in 1966 and Anthony Downs in 1973 published influential and highly critical books against exclusionary zoning. Around the same time, Robert Linowes and Don Allensworth wrote a book criticizing zoning's damage to the economic opportunity of the poor.[53] Most aptly, they argued: "Because of zoning, the 1954 Supreme Court integration decision has become impossible to implement in that it cannot be carried out short of busing students all over town."[54]

With this strong intellectual foundation, opponents of economic segregation won a major victory in the New Jersey Supreme Court in 1975.[55] Municipalities were directed by the court to provide their "fair share" of affordable housing. A 1977 Pennsylvania Supreme Court case also ruled against exclusionary zoning, and created the standard that towns must provide their fair share of land uses so as not to violate the property rights of developers, (though it mandated nothing about allowing affordable housing under the zoning laws).[56]

Yet, in the early 1970s, court mandates to integrate schools through busing were received by many whites with intense opposition, and following a 1974 Supreme Court decision that effectively shielded outer suburbs from this policy the migration of whites to these places increased considerably.[57] The tide in favor of integration seemed to be turning and was dealt a major blow in 1977 when the U.S. Supreme Court case upheld the zoning policies in suburban Chicago against a non-profit development corporation that aimed to construct multi-family units for racially integrated low-income residents at the behest of the land owner, a Catholic religious order.[58]

After this decision, the zoning reform movement ground to a halt. As one scholar put it, "As we approach the 21st century, African-Americans' ability to challenge exclusionary zoning as a violation of constitutional rights is virtually nonexistent."[59] Even in New Jersey, the apparent victory achieved at the judicial level was dramatically undermined by the state legislature through the passage of the 1985 New Jersey Fair Housing Act. This bill allowed exclusive municipal governments to effectively pay more urban jurisdictions for the right to remain exclusionary.[60] This policy was eventually eliminated in 2008, but the current governor of New Jersey has effectively stopped enforcing the requirement to provide fair housing.[61] Meanwhile, the federal government has never passed legislation addressing exclusionary zoning, and it is entirely absent as an issue in Presidential campaigns.

In some places battles over zoning and affordable housing have continued, slowly, at the local level. For example, in New York, the Westchester County government was sued for misleading HUD about plans to build racially integrated housing with federal money, but even a court settlement in 2009 has not yet spurred significant action to redress the problem.[62]

Methods

Data for this report come from a variety of sources. This section offers a brief description of the sources and methods, while the external appendix on the Brookings website (http://www.brookings.edu/papers/2012/0419_school_inequality_rothwell.aspx) provides greater detail.

School Data

Public school test score data are provided by GreatSchools, which compiles state-mandated test score results for every public school in the country for which data is available (84,077 schools). The scores are reported as the share of students who score at or above proficiency, in a given subject for a given grade. Since states write the exams, administer them, and implement their own standard for proficiency, state averages are subtracted from school scores for each subject, grade, and year to calculate a single **state-adjusted score** for each school. For each school, the most recent year's test score data are used, with over 90 percent coming from 2010 and 2011.[63]

Student enrollment data for 2009-2010, the latest available at the time of writing, come from the National Center for Educational Statistics (NCES) Common Core of Data. Enrollment data are provided by race and for the number of students eligible for the free or reduced price lunch program. Students are eligible for the free lunch program if family income is less than or equal to 1.3 times the poverty line and for reduced price lunch if less than or equal to 1.85 times the poverty line.[64] In this report, these groups are referred to as "poor" and "low-income," respectively. NCES data from 1997-1998, the earliest available online, are used to examine trends in exposure of students to different groups.

The **school test-score gap** is one of this report's key measures. It is defined as the difference in percentile ranking (on a scale of 1-100) for the average school attended by two different groups of students. The percentile ranking for each school is based on the state-adjusted score described above. Each school's state-adjusted score is ranked against all other schools in the country when presenting national results. In other words, the highest-rated school in the country is the one that most exceeds its state average. For metropolitan area results, however, the state-adjusted score is ranked only against schools in the same metropolitan area (which, for some metros, includes schools in adjacent states). So the metro test score gap ranks schools (by state adjusted test scores) only against schools in the same metropolitan area.

For each group, the average test score is calculated using a weighted average based on the enrollment of that group. Unless otherwise noted, findings report the difference between low-income students (those who are deemed eligible for the free or reduced lunch program—meaning incomes are less than 1.85 times the federal poverty line) and those who are middle/high-income (meaning students ineligible for free or reduced price lunches), but the school test-score gap is also reported between whites and minority racial groups.[65]

For national and metropolitan summary data, the school test score gap is reported using data on all public schools. For parts of the analysis that compare the test score gap to housing costs, the test score gap is calculated only for the 48,008 schools in which a majority of students are enrolled in elementary grades (i.e., kindergarten to fifth grade).

Location and housing costs

School districts around the country create "attendance zones" to decide which addresses within the district are allowed to attend which schools. Typically, districts assign students to a nearby school, and in most cases, students live within two miles of their school; indeed roughly one third of elementary and middle school students live within a mile of their school, according to national survey data.[66] Unfortunately, data on school attendance zones are not widely available. Therefore, researchers must come up with a proxy to measure characteristics of its attendees and their families. One can use NCES data on the longitude and latitude of every public school to assign census tracts, but those tracts are typically too small (average population of 4,000) to represent attendance zones.[67]

To deal with this problem, this study creates a **hypothetical attendance zone** surrounding each school using both ArcGIS software and census tract data from the American Community Survey

(ACS) 2005-2009 5-year estimates. Attendance zones are typically wider (and therefore less tied to nearby residence) for secondary schools since they serve a smaller metropolitan age cohort (9th grade through 12th) compared to primary schools (grades kindergarten through 5th) and thus pull in students from around the metropolitan area into larger individual schools. To maximize the probability that proximity is important to attendance, this study calculates housing costs only for schools in which a majority of students are enrolled in elementary grades (i.e., kindergarten to fifth grade). Census tracts within 10 miles of these schools are ranked by distance from the school to the center of the tract. Each tract is given a weight equal to the number of students enrolled in school from kindergarten to fifth grade as reported on the ACS. Schools are "assigned" to the nearest census tract until enrollment equals the cumulative population of enrolled students.

Housing cost data for census tracts come from the ACS as well. Median monthly housing costs associated with renting or owning were used to calculate a weighted average of neighborhood housing costs, using the share renting and share owning in the tract as weights. The housing costs for a given school are therefore a weighted average of tract housing costs, using tract enrollment shares as the weight.

The **housing-cost gap** is defined for a given metropolitan area as the average costs of living near schools in the top 20th percentile on test scores divided by the average costs of living near schools in the bottom 20th percentile on test scores. This ratio indicates the relative costs of moving from a neighborhood with a low-scoring school to a neighborhood with a high-scoring school.

Zoning

Comparable national data on zoning or land use regulations is very rare, since they are not collected by state and federal governments. A handful of economists and social scientists have conducted their own surveys in recent years or focused their analysis on regional case studies. This report pulls together four different sources of information on zoning. The methods appendix discuses them in detail.

➤ *Pendall survey:* In 2003, Rolf Pendall conducted a representative survey of the 50 largest metropolitan areas (now 49 due to a statistical merger). The results were analyzed and reported in a Brookings report co-authored by Robert Puentes in 2006.[68] The main survey question used here is: "What is the maximum number of units allowed in the jurisdiction per acre of land?" This is available for 1,677 local governments in 50 of the largest metropolitan areas in the United States, as of 2000. The local measures are aggregated to metropolitan areas, since the survey sample was designed to be representative of local governments in those areas. The index can be interpreted as a measure of anti-density or exclusionary zoning in the metropolitan area.

➤ *Zoning law firm index*: To overcome the limitations of a small sample size of metros, the report introduces a zoning law firm index for the state of each school. States with a disproportionate number of law firms that specialize in zoning or land use law are likely to have a disproportionate number of disputes over land use because of restrictive zoning laws. To implement this, a search was conducted of lawyers.com, a Lexis Nexis website that advertises legal services across the United States.[69] The website allows one to search for firms by area of law and includes "zoning, planning, and land use" as a category. To adjust for the size of the state and any differences in propensity to advertise on lawyers.com, the number of law firms with zoning specialties is divided by the total number of law firms. The state values are assigned to schools based on state location, and then averaged across all schools in the metropolitan area. For metros that are entirely in one state, the metro average equals the state value. The metropolitan index is highly correlated with the Pendall measure for the 49 metropolitan areas in which they overlapped (correlation coefficient of 0.57). Overall, older states with a high volume of low density housing tend to have more law firms specializing in zoning; this is consistent with the pattern of urbanization and zoning described in the literature on zoning.

➤ *Wharton School survey index:* Aggregated measures of zoning policy lose some of the local detail and introduce error. To provide that detail, two other surveys are used. One is a nationally representative survey of local governments conducted by scholars at the Wharton School at the University of Pennsylvania.[70] It is referred to here as the "Wharton Index." It is not representative at the metropolitan scale, so only the local observations are used. 922 observations are successfully matched to metropolitan areas and local governments with public school test score data. To measure exclusionary zoning with these data, three survey questions are quantified and turned into an equally weighted

index that varies from zero to 100. Two of those questions asked local officials to rate the importance of regulating density on single family and multi-family units on a one to five scale. The third asked for the jurisdiction's minimum lot size requirement—that is the size of the lots in acres required for a unit of housing.

➤ *Eastern Massachusetts zoning index:* Finally, for a comprehensive look at a particular region, regulatory data is used from a 2004 study of housing regulations in Massachusetts by the Pioneer Institute and Rappaport Institute.[71] Researchers there collected data from a variety of public and private resources to put together a database of regulations for 187 local governments, which encompasses all local governments in Massachusetts that are within 50 miles of Boston. Four variables are used in the report that are considered especially relevant to restrictions on dense or inexpensive housing: Minimum lot size, whether multi-family housing is allowed only be special permit, the longest length of frontage requirements in the town, and the percentage of zoning districts in the town that require large frontage requirements. These variables are individually scaled to percentiles and then averaged and re-scaled to a single comprehensive percentile index, ranging from one to 100.[72]

A note on empirical methods

The quantitative findings below that identify correlations and possible causal relations here are supported by more detailed statistical analysis. The data sources and regression methods used as the basis of these findings are discussed and shown in the external appendix found here.

Website

These main variables—including the school test-score gap and the housing cost gap—are available for all metros on the Brookings website, which also includes profiles for the 100 largest metropolitan areas and mapping tools (http://www.brookings.edu/info/schools/school_access_interactive.aspx).

Findings

A. Nationwide, the average low-income student attends a school that scores at the 42nd percentile on state exams, while the average middle/high-income student attends a school that scores at the 61st percentile on state exams.

The Background section discusses evidence that children benefit from attending higher-scoring schools. One possible explanation for why children from disadvantaged groups lag on measures of educational achievement is that they lack access to high-scoring schools.

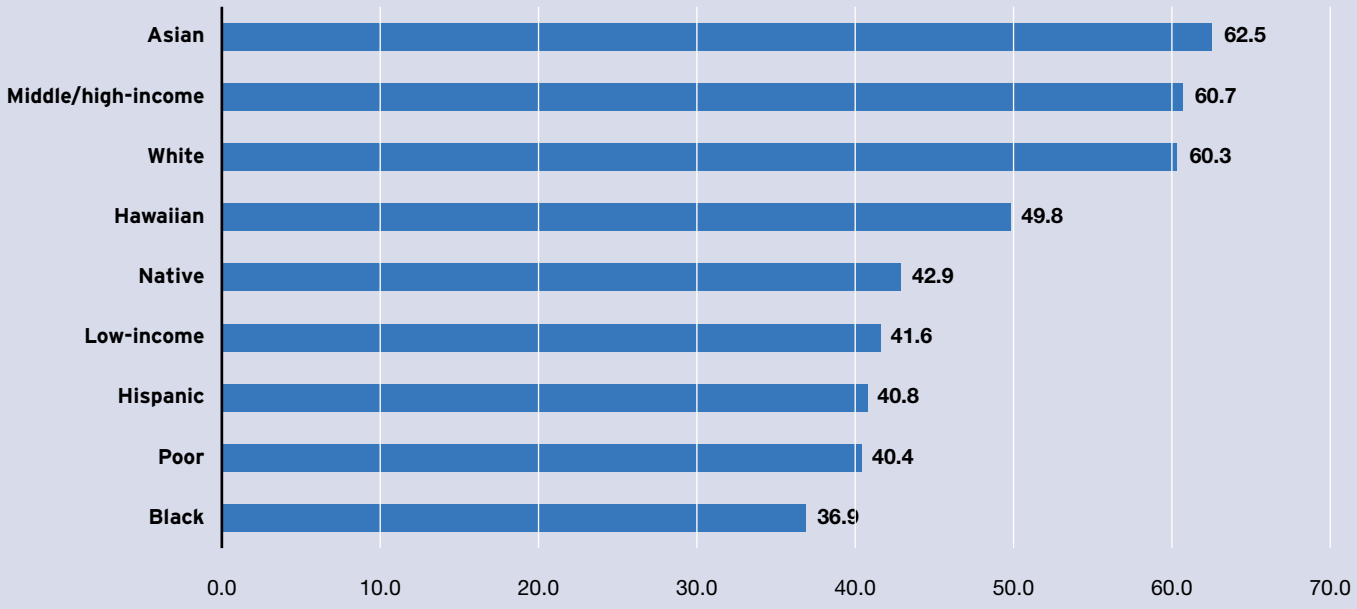
Nationwide data point to significant test-score gaps between the schools that low-income and black/Hispanic children attend, and the schools that other children attend. As Figure 1 illustrates, the average low-income student enrolled in public schools attends a school that scores at just the 42nd percentile of all schools in its state on standardized exams, compared to the 61st percentile for the average middle/high-income student. The average poor student (family income below 130 percent of poverty) attends an even slightly lower-scoring school (40th percentile).

Blacks and Hispanics also disproportionately attend low-scoring schools. The average black student and the average Hispanic student are enrolled in schools that score at the 37th and 41st percentiles, respectively. Meanwhile, the average white and Asian students are enrolled in schools that score at the 60th and 63rd percentiles, respectively.

The school test-score gap between groups is quite similar to the test-score achievement gap between groups at the student level. National mathematics test score data for 12th grade students show that the average black student scores 0.85 standard deviations below the average white student; for both Hispanics and low-income students, the gap is 0.68 standard deviations.[73] The data analyzed here on school test scores show that the average black student attends a school ranked 0.85 standard deviations below that which the average white student attends; for Hispanics and low-income students the difference is 0.63 standard deviations.[74]

If all racial, ethnic, and income groups were distributed evenly across schools, then the school test-score gap would be zero, even if achievement gaps persisted among different groups. However, disadvantaged groups tend to be highly segregated, based on Brookings analysis of NCES data for

Figure 1. Percentile Rank on State Exams of School Attended, Average U.S. Public School Student by Group, 2010-2011



Source: Brookings analysis of data from GreatSchools and NCES. X-axis adjusts for state mean for test's grade, subject, and test year (when year varies). Averages are weighted by group share of student enrollment. Low-income refers to students eligible for the free or reduced price lunch program, meaning family income is less than 1.85 times the poverty line. Poor refers to students eligible for the free lunch, meaning family income is less than 1.3 times the poverty line. Middle/ high-income refers to students who are not eligible for free or reduced priced lunch.

84,077 public schools in the database. The average black student, for example, attends a school that is 50 percent black (and 29 percent white), whereas blacks only comprise 16 percent of all public school enrollment (and whites 54 percent). The average Hispanic student attends a school that is 55 percent Hispanic, even though Hispanics account for only 22 percent of all U.S. students. The average low-income student attends a school where 64 percent of fellow students are low-income, though they represent only 48 percent of all U.S. public school students. Moreover, poor students have become more concentrated in schools with other poor students since 1998.[75]

Only a small fraction of the nation's public schools could be described as truly integrated by income. If one defines a school as economically integrated if its share of low-income (free or reduced lunch eligible) students falls within five percentage points—plus or minus—of the metropolitan average, then only 5 percent of public schools in the 100 largest metropolitan areas meet that standard. The percentage of integrated schools is as high as 11 percent in smaller, more homogenous metropolitan areas, but for all metro areas combined, it is still under 7 percent.

Do low-income students do better in higher-scoring schools?

There is compelling evidence from studies based on lottery-based assignment or other random administrative mechanisms that poor and minority students succeed at higher rates in better-performing schools—measured by test scores or future adult outcomes.[76] Likewise, related studies show important benefits from attending classes with higher scoring students and higher "value-added" teachers.[77] In addition to those factors, teacher experience is strongly related to student outcomes but experienced

teachers are less likely to teach disadvantaged students.[78] Furthermore, teacher experience is highly correlated with school test scores, even adjusting for other factors, and the average black, Hispanic, or low income student attends a school with significantly less experienced teachers than white and Asian students.[79]

School test-score gaps thus reflect the combination of two well-recognized phenomena: achievement gaps that persist by race, ethnicity, and income; and school segregation by these same factors. As described in the Background section, however, those gaps may ultimately have more pernicious effects, to the extent they prevent disadvantaged students from accessing higher-quality learning environments (e.g., with higher-scoring peers or better teachers).

Unfortunately, the data here are not refined enough to permit a strong conclusion about how school test scores affect student performance. However, they do show that low-income students in higher-scoring schools perform better on exams than their peers elsewhere.

The results in Table 1 below show that the test scores of low-income students are highly correlated with the scores of their middle/higher-income schoolmates. In other words, low-income students perform better when their non-low-income schoolmates perform better. Low-income students who attend schools with the lowest-scoring middle/high-income students score 18.5 percentage points below the state average for their subject/grade, but those who attend schools with top-scoring middle/high-income peers score 2 percentage points above state averages. Further regression analysis finds that the proficiency rates of low-income students increase by 0.7 percentage points for every 1 percentage point increase in the proficiency rates of middle/high-income students in the same school, controlling for factors such as the school's racial diversity, enrollment, share of low-income students, pupil-teacher ratio, and location.[80]

This analysis does not reveal why low-income students who are enrolled with higher-scoring middle/high-income peers do better on state exams. It may be that teachers, parent volunteers, and/or other higher-scoring students improve the learning environment for low-income children. It may also be that parents of the low-income students enrolled in higher-scoring schools confer subtle advantages to their children that are not captured in the available data. Nonetheless, these data align with previous research finding that higher-quality school environments may improve student performance among disadvantaged groups.

Average Test Scores for Low-Income Students by Performance of Middle/High-Income Students in Same School

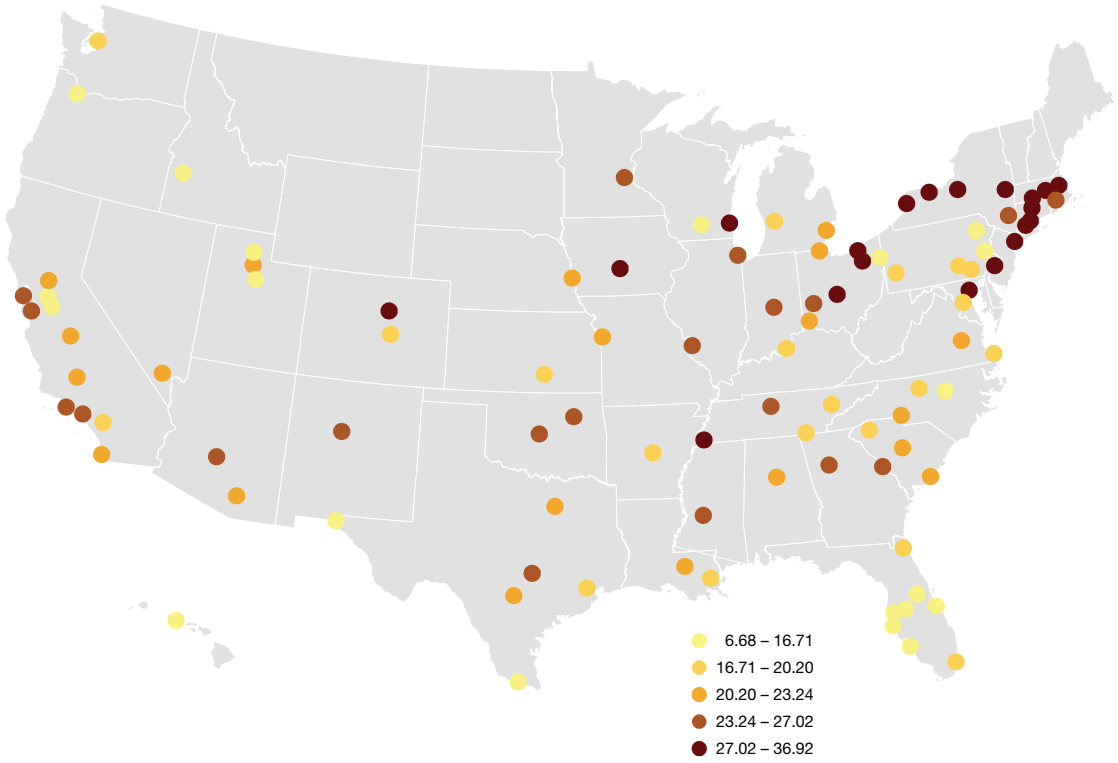
School quintile by middle/high-income student performance	Average proficiency rate of low-income students relative to state mean	Average proficiency rate of middle/high-income students relative to state mean
Top quintile	2.1	23.0
Fourth quintile	-2.2	13.8
Middle quintile	-4.0	9.3
Second quintile	-7.8	4.3
Bottom quintile	-18.5	-9.7

Source: Brookings analysis of NCES and GreatSchools test score data from 51,613 schools in 35 states plus the District of Columbia. Averages weighted by NCES enrollment data.

B. Northeastern metro areas with relatively high levels of economic segregation exhibit the highest school test-score gaps between low-income students and other students.

School test-score gaps vary considerably across the country, reflecting a highly uneven landscape of racial and economic diversity, segregation, and achievement gaps among and within the nation's major

Figure 2. The School Test Score Gap in the 100 Largest Metropolitan Areas



Source: Brookings analysis of data from GreatSchools and the NCES. The test score gap refers to the dierence in test score performance (on a 1-100 scale) between the average school attended by low-income students and the average school attended by middle/high income students.

metropolitan areas.

In many metropolitan areas, low-income students attend schools with far lower test scores than their middle- and high-income counterparts (Table 2). Northeastern metro areas have particularly large gaps. Indeed, six of the 10 metro areas with the highest test score gaps are in the Northeast, including Bridgeport, Hartford, New Haven, Buffalo, Rochester, and Philadelphia. At least 30 percentile points separate the school ranking of the average low-income student from the average middle/high income student. Three Midwestern metro areas—Milwaukee, Akron, and Cleveland—also rank among the 10 with the largest gaps (Figure 2).

In other metro areas, particularly those in the South and West, school test scores do not differ greatly between the average low-income and middle/high-income students. Figure 2 shows that metro areas with the smallest school test-score gaps include five in Florida (Cape Coral, North Port, Orlando, Lakeland, Palm Bay), one in Texas (El Paso), and two in the Intermountain West (Boise and Provo). Scranton and Modesto round out the list.

Not surprisingly, metropolitan school test-score gaps relate strongly to patterns of metropolitan economic segregation. Table 2 also shows a "dissimilarity index" for each metro area. That index measures the percentage of low-income students that would have to switch schools with middle/high-income students in another ZIP code in order to attain an equal distribution of enrollment by income across all ZIP codes within a metropolitan area. The index is much higher in metro areas with the highest school test-score gaps than in metro areas with the lowest such gaps.[81]

Table 2. Highest and Lowest School Test-Score Gaps and Economic Segregation Levels, 100 Largest Metro Areas, 2010–2011

	School test-score gap	Zip code segregation in student enrollment—low-income from middle/high-income
Highest school test-score gaps		
Bridgeport-Stamford-Norwalk, CT	36.9	0.61
Hartford-West Hartford-East Hartford, CT	34.5	0.54
Milwaukee-Waukesha-West Allis, WI	32.8	0.55
New Haven-Milford, CT	32.5	0.53
Buffalo-Niagara Falls, NY	31.1	0.47
Baltimore-Towson, MD	31.1	0.50
Rochester, NY	31.0	0.47
Akron, OH	30.9	0.48
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	30.8	0.53
Cleveland-Elyria-Mentor, OH	30.3	0.49
Lowest school test-score gaps		
Palm Bay-Melbourne-Titusville, FL	13.5	0.24
North Port-Bradenton-Sarasota, FL	13.0	0.26
Scranton—Wilkes-Barre, PA	12.5	0.32
Boise City-Nampa, ID	12.4	0.31
Modesto, CA	12.4	0.27
Orlando-Kissimmee-Sanford, FL	11.2	0.28
Provo-Orem, UT	9.8	0.24
Lakeland-Winter Haven, FL	8.2	0.19
Cape Coral-Fort Myers, FL	8.2	0.27
El Paso, TX	6.7	0.28
Unweighted Average for 100 Largest MSAs	**22.0**	**0.39**

Source: Brookings analysis of data from GreatSchools and the National Center for Education Statistics. Low-income students defined here as those eligible for either free or reduced price lunch. Schools are ranked by state-adjusted test scores against all other schools in the same metro.

Variation in metropolitan income inequality and demographic diversity contributes to the variation in school test-score gaps across metro areas. Metro areas with high income inequality and high median incomes tend to have significantly larger test-score gaps, while metro areas with large retirement-age populations tend to have lower test-score gaps.

Yet some metropolitan areas exhibit relatively small or large school test-score gaps in light of their underlying demographic and economic profiles. Metro characteristics including household income inequality (measured using the Gini coefficient), black and Hispanic population shares, median household income, the share of the population aged 65 and older, and the median age of the population account for about half of the variation in metro-level school test-score gaps between middle/high-income and low-income students. Table 3 compares the actual school test-score gap shown in Table 2 to the predicted test-score gap, based on the metro area's demographic and economic characteristics.

Large metro areas in the Northeast had the largest school test score gaps relative to their levels of income inequality and demographic characteristics. In particular, Buffalo, Hartford, Rochester, New Haven, and Springfield exhibit much greater school test-score disparities than one would expect based on metro characteristics alone. At the same time, four metro areas in the Midwest—Milwaukee, Des Moines, Cleveland, and Akron—have larger gaps than predicted.

On the other hand, Raleigh exceeded expectations by the largest margin. Its test score gap of 14.7 is over 10 percentage points lower than its predicted test score gap of 25.5. One possible explanation is that Wake County has a history of aggressive district-wide socioeconomic integration policies.[82]

Washington, D.C., Orlando, El Paso, Jacksonville, and Cape Coral are other Southern metro areas that maintain lower than expected test score gaps. In the West, Seattle, Portland, and Boise surpass expectations. Scranton and Madison also make the list.

As Table 2 above showed, economic segregation is associated with larger test-score gaps. That remains true after controlling for the broad economic and demographic factors listed above. As Table 3 shows, several more economically integrated metro areas provide more equitable schooling across income groups, even when their overall economic and demographic profiles would suggest otherwise.

Table 3. Metropolitan Areas with the Largest and Smallest Differences in School Test Score Gaps after Adjusting for Economic and Demographic Characteristics

MSA	Predicted gap in school test scores	Actual gap in school test scores	Percentile rank on income inequality	Zip-code enrollment segregation
MSAs with 10 largest school performance gaps compared to expectations				
Milwaukee-Waukesha-West Allis, WI	22.3	32.8	62	0.55
Hartford-West Hartford-East Hartford, CT	24.8	34.5	56	0.54
Buffalo-Niagara Falls, NY	21.9	31.1	59	0.47
New Haven-Milford, CT	23.4	32.5	69	0.53
Rochester, NY	21.9	31.0	42	0.47
Akron, OH	23.3	30.9	59	0.48
Springfield, MA	21.7	28.5	52	0.49
Des Moines-West Des Moines, IA	21.6	28.3	21	0.46
Cleveland-Elyria-Mentor, OH	23.8	30.3	81	0.49
Baltimore-Towson, MD	24.8	31.1	52	0.50
Average for group	**23.0**	**31.1**	**55**	**0.50**
MSAs with 10 smallest school performance gaps compared to expectations				
Cape Coral-Fort Myers, FL	14.8	8.2	85	0.27
Jacksonville, FL	23.8	17.0	58	0.30
Madison, WI	23.6	16.7	35	0.28
Boise City-Nampa, ID	19.4	12.4	24	0.31
Washington-Arlington-Alexandria, DC-VA-MD-WV	27.0	19.4	32	0.39
Seattle-Tacoma-Bellevue, WA	26.4	18.8	39	0.36
Portland-Vancouver-Hillsboro, OR-WA	24.2	16.6	39	0.28
Scranton—Wilkes-Barre, PA	20.1	12.5	56	0.32
Orlando-Kissimmee-Sanford, FL	19.5	11.2	54	0.28
Raleigh-Cary, NC	25.8	14.7	43	0.24
Average for group	**22.4**	**14.8**	**47**	**0.30**
Unweighted Average for 100 largest metros	**21.3**	**21.3**	**57**	**0.38**

Source: Brookings analysis of GreatSchools, National Center for Education Statistics, and the U.S. Census Bureau's 2005-2009 American Community Survey. The predicted gap is based on the average effects of metro variables such as income inequality, median income, median age, share of population over 65 years old, and the black and Hispanic share of the population.

Data for young black and Latino adults suggest that school test-score gaps may not only limit student achievement, but also matter for later outcomes like employment, enrollment, and earnings, even controlling for family income. Individual black or Latino young adults living in metropolitan areas with high-scoring schools for their groups have higher average incomes, are more likely to be enrolled or employed, and, for blacks, are more likely to have attended post-secondary school. (Table 4; see external Appendix for full results). For a young black adult, living in a metro area where blacks attend high-scoring schools is associated with $3,000 in extra income compared to a young black adult living in a metro where blacks attend low-scoring schools. This difference is highly significant. Likewise, blacks living in metros with high test scores have a 9 percentage point higher probability of having

Table 4. Effect on Income, Educational Attainment, and Employment/Enrollment, Blacks and Hispanics Aged 18 to 25, Metro Areas with High- versus Low-Scoring Public Schools for Average Black and Hispanic Students

	Income		Attained some college or higher education		Employed or in school	
	Blacks	Hispanic	Blacks	Hispanic	Blacks	Hispanic
Metro with high average test scores compared to metro with low average test score	$3,040	$3,619	9%	6%*	9%	12%

*The numbers displayed are the estimated marginal effect of living in a metro with test scores at the 88th percentile relative to test scores at the 38th percentile (37th percentile for Latinos), for the group in question. This difference reflects the range across the 100 largest metros for each group. These results are calculated from a regression analysis shown in the methods appendix (available on Brookings website), which controls for a number of individual and metro level variables. Source: Brookings analysis of data from GreatSchools, the Bureau of Labor Statistics, and the 2010 American Community Survey, accessed via IPUMS. *There is no significant correlation between test scores and post-secondary attainment for Latinos. Others results are significant below 0.05 level. Results are potentially biased, since young adults are not randomly assigned to metropolitan areas.*

attained a post-secondary education or being employed or enrolled. The results are similar for Latinos, except the effect on post-secondary attainment is not statistically significant. These findings suggest potentially large economic benefits for metros that improve minority access to high-scoring schools, but must be interpreted with caution, given the methodological limitations.[83]

C. Across the 100 largest metropolitan areas, housing costs an average of 2.4 times as much, or nearly $11,000 more per year, near a high-scoring public school than near a low-scoring public school.

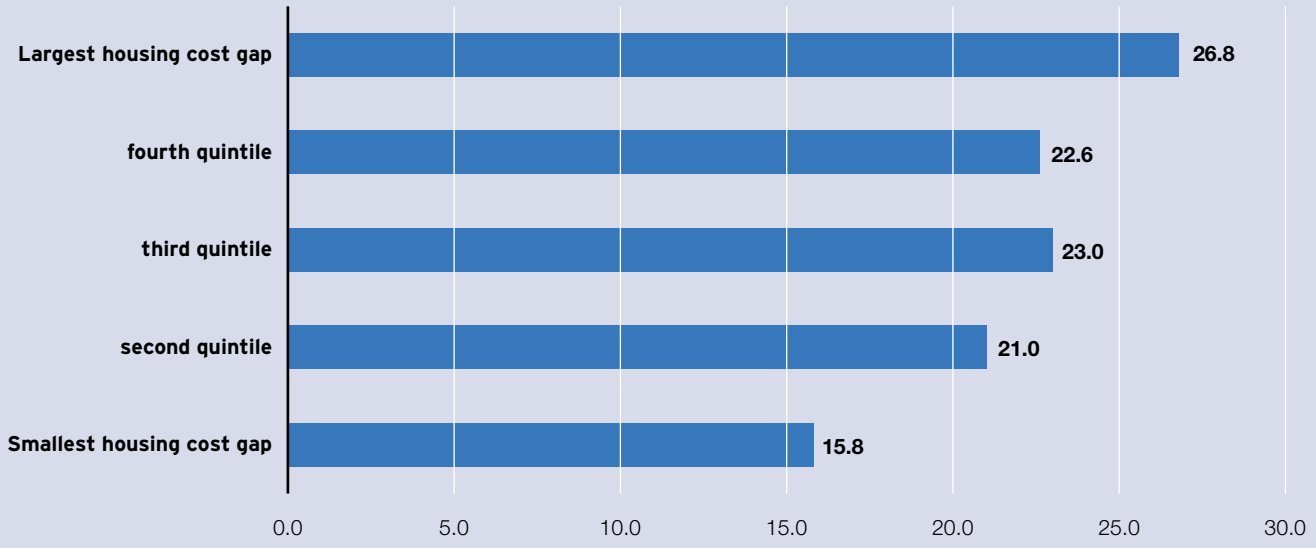
The above sections demonstrate that access to high-scoring schools is vastly unequal across income and racial/ethnic groups, and across metropolitan areas due to differing demographic and economic characteristics and levels of segregation. At the same time, recent research supports the idea that higher-scoring schools benefit disadvantaged children, boosting their academic achievement and future labor market success. Parents intuitively understand this. Experimental evidence shows that the parents of disadvantaged students will try to enroll their children in higher-scoring schools—measured by test scores—when given salient information, especially when they live closer.[84] As this section and the next show, however, many local governments have laws that effectively block low-income students and their families from living near or attending these schools.

The effective price difference between housing in neighborhoods with high-scoring versus low-scoring schools provides initial evidence of these barriers. The *housing cost gap* measures the difference in median housing costs (rental or mortgage payments) between neighborhoods with the highest-scoring elementary schools and those with the lowest-scoring elementary schools on statewide exams. Across all 100 metropolitan areas, housing near the highest-scoring schools is 2.4 times as expensive as near the lowest-scoring schools; in dollar terms, that difference is $10,707. On average, median home values are $205,000 higher in the neighborhood near high-scoring schools.

Likewise, the size of homes and availability of rental units differ significantly in these neighborhoods. The median home near top-scoring schools has 1.5 additional rooms and the share of rental units is roughly 30 percentage points lower, compared to homes in the neighborhoods of low-scoring schools.

To put the average cost gap of nearly $11,000 in perspective, it can be compared to tuition at the average private school. According to the National Center for Education Statistics, during the 2007-2008 school year (the most recently available data) average private school tuition for elementary and secondary students was $8,549 nationwide, and for Catholic schools, average tuition was just over

Figure 3. Average Test Score Gap for Elementary Schools by Housing Cost Gap in the 100 Largest Metropolitan Areas



Source: Brookings analysis of data from GreatSchools, the National Center for Education Statistics, and the U.S. Census Bureau 2005-2009 American Community Survey. Data include the 100 largest metropolitan areas. X-axis is the school test-score gap between low-income and middle/high-income students (on a 1-100 scale). The housing cost gap, on the Y-axis, refers to the average housing costs in tracts of top-quintile scoring schools, divided by bottom-quintile scoring schools.

$6,000.[85] Moreover, in 78 out of 91 large metro areas for which data were available from the National Catholic Education Association, elementary Catholic school tuition for non-Catholic children was cheaper than the public school premium for high-scoring elementary schools (tuition is sometimes less expensive for Catholics or parish members).[86] In effect, housing costs may make high-scoring public schools as elusive to disadvantaged groups as typical private schools.

Regardless of the relative value of public versus private education, the housing-cost premium for top-scoring schools is strongly associated with the school test-score gap itself. In metro areas with the largest housing-cost gaps, low-income students attend schools that rank an average of 27 percentile points lower on test score performance than middle/high-income students (Figure 3). That compares to 16 percentile points in metro areas with the smallest housing-cost gaps.

Metro areas in the Northeast tend to have the highest housing-cost gaps and those in the South and West tend to have the smallest. Metropolitan Bridgeport, Philadelphia, New York City, Buffalo, and Hartford are among the ten metro areas with the largest housing cost gaps, and each of the ten has a larger-than-average elementary school test score gap between low-income and middle/high-income students (Table 5). In Bridgeport, the most extreme case, it is 3.5 times more expensive to live near a high-scoring school as a low-scoring school; would-be movers would have to spend about $25,000 more per year on housing to make that jump. In all nine metro areas for which data are available, as many as two children from a family living near a low-scoring school could attend the average Catholic school for less than the additional housing costs the family would bear in moving to a neighborhood near a high-scoring school. By contrast, in metro areas such as Boise, Little Rock, Lakeland, Madison, Modesto, and Provo, there are fairly low housing-cost gaps, and all are roughly equal to or lower than

Table 5. Largest and Smallest Housing-Cost Gap, and Corresponding Elementary School Test-Score Gap, 100 Largest Metropolitan Areas

	Housing cost gap	Housing cost difference	Elementary School test- score gap	Average Catholic school tuition
Large metropolitan areas with largest housing cost gap				
Bridgeport-Stamford-Norwalk, CT	3.5	$25,038	37.6	$7,434
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	3.5	$14,285	32.9	$4,448
Columbus, OH	3.3	$12,847	27.3	$4,997
Fresno, CA	3.2	$11,331	28.6	
New York-Northern New Jersey-Long Island, NY-NJ-PA	3.1	$15,696	28.9	$5,109
Baltimore-Towson, MD	3.0	$13,181	33.2	$6,082
Buffalo-Niagara Falls, NY	2.9	$8,172	33.2	$3,823
Cleveland-Elyria-Mentor, OH	2.9	$9,596	32.0	$3,454
Los Angeles-Long Beach-Santa Ana, CA	2.8	$15,641	33.3	$4,510
Hartford-West Hartford-East Hartford, CT	2.8	$12,375	37.8	$4,391
Large metropolitan areas with smallest housing cost gap				
Ogden-Clearfield, UT	1.6	$5,684	18.6	$5,434
Palm Bay-Melbourne-Titusville, FL	1.5	$4,505	23.8	$6,332
Lakeland-Winter Haven, FL	1.5	$3,253	19.1	$6,000
Honolulu, HI	1.5	$5,253	19.8	$6,260
Salt Lake City, UT	1.5	$4,921	26.2	$6,250
Provo-Orem, UT	1.4	$4,241	14.1	
Little Rock-North Little Rock-Conway, AR	1.4	$2,241	23.1	$4,816
Madison, WI	1.3	$3,770	18.8	$4,400
Modesto, CA	1.3	$3,070	19.3	
Boise City-Nampa, ID	1.3	$2,327	15.1	$4,390
Unweighted average of largest 100 MSAs	**2.2**	**$8,410**	**26.0**	**$5,446**

Source: Brookings analysis of data from the U.S. Census Bureau's 2005-2009 American Community Survey, GreatSchools, Texas Education Agency, National Center for Education Statistics, and the National Catholic Education Association. The housing cost gap and test score gap are for elementary schools.

Catholic school tuition. Finally, the school test-score gaps are roughly at or below average for all ten.

D. Large metro areas with the least restrictive zoning have housing cost gaps that are 40 to 63 percentage points lower than metro areas with the most exclusionary zoning.

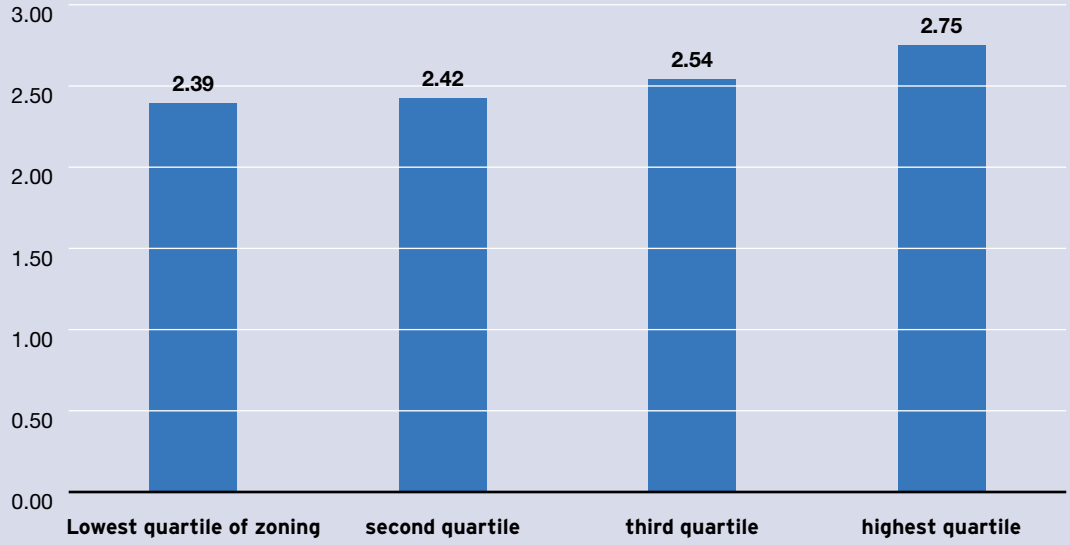
Affluent residents of major metropolitan areas often live in municipal jurisdictions or zoning districts (homogenously zoned areas within a jurisdiction) that discourage or directly prevent the development of inexpensive housing units. While this may allow for lower tax rates and more stable housing prices, it sets up a major barrier to entry for low-income residents who might wish to send their children to schools in that area.[87]

Data from the Wharton survey indicate that 84 percent of jurisdictions impose minimum lot size requirements of some kind (the average jurisdiction with zoning power has a minimum lot size of 0.4 acres), and 22 percent of jurisdictions have laws forbidding housing units on lots smaller than one acre.[88] Data from the 2009 American Housing Survey show that the median single-family housing unit nationwide sits on 0.26 acres, and only 29 percent of housing units are on lots larger than one acre.[89] In other words, zoning laws, on average, prohibit even today's typical single-family home from being built.

Metropolitan data

Zoning regimes contribute to the cost gap within metro areas between housing in neighborhoods with high- versus low-scoring schools. Comparing the top and bottom quartiles of regulation, more restrictive zoning is associated with a nearly 40 percentage point increase in the metropolitan housing-cost gap. This result holds using either data from the Pendall survey of 49 large metropolitan areas or the zoning law firm index for all of the 100 largest metro areas (Figure 4).

Figure 4. The Housing Cost Gap by Prevalence of Zoning Laws in the 100 Largest Metropolitan Areas



Source: Brookings analysis of data from the U.S. Census Bureau's 2005-09 American Community Survey, GreatSchools, National Center for Education Statistics, and Lawyers.com. MSAs are weighted by 2010 population in calculating averages.

At the metropolitan level, school test-score gaps, housing-cost gaps, and restrictive zoning all relate to one another. In the 100 largest metro areas, those metro areas with the largest housing-cost gaps exhibit school test-score gaps that are 12.7 percentage points higher, on average, than in metro areas with the smallest housing-cost gaps (Table 6). In turn, zoning is significantly more restrictive in the high housing-cost gap metro areas–by 17 percentile points in the state-based zoning law-firm index and a larger margin using the Pendall survey of anti-density zoning (where data is available). While zoning clearly does not explain all of the variation in the housing-cost gap across metro areas—the California metros, for example—the relationship is strong and statistically significant, and thus deserves greater attention as a source of inequality in access to high-scoring schools.[90]

Table 6. Housing Cost Gap, Elementary Test Score Gap, and Zoning in the 100 Largest Metropolitan Areas

Metropolitan Area	Housing Cost Gap	School test-score gap	Zoning law firm index (1-100)	Anti-density zoning restrictions (1-100)
Large metros with the largest housing price premium near top-quintile schools				
Bridgeport-Stamford-Norwalk, CT	3.5	37.6	98	
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	3.5	32.9	93	76
Columbus, OH	3.3	27.3	67	86
Fresno, CA	3.2	28.6	10	
New York-Northern New Jersey-Long Island, NY-NJ-PA	3.1	28.9	84	74
Baltimore-Towson, MD	3.0	33.2	63	
Buffalo-Niagara Falls, NY	2.9	33.2	75	98
Cleveland-Elyria-Mentor, OH	2.9	32.0	66	80
Los Angeles-Long Beach-Santa Ana, CA	2.8	33.3	9	11
Hartford-West Hartford-East Hartford, CT	2.8	37.8	98	94
Average for group	**3.1**	**32.5**	**66**	**74**
Large metros with the smallest housing price premium near top-quintile schools				
Ogden-Clearfield, UT	1.6	18.6	59	
Palm Bay-Melbourne-Titusville, FL	1.5	23.8	34	
Lakeland-Winter Haven, FL	1.5	19.1	34	
Honolulu, HI	1.5	19.8	79	
Salt Lake City, UT	1.5	26.2	59	27
Provo-Orem, UT	1.4	14.1	58	
Little Rock-North Little Rock-Conway, AR	1.4	23.1	6	
Madison, WI	1.3	18.8	62	
Modesto, CA	1.3	19.3	10	
Boise City-Nampa, ID	1.3	15.1	95	
Average for group	**1.4**	**19.8**	**50**	**27**
Unweighted average for 100 largest metros	**2.2**	**26.0**	**49**	**49**

Source: Brookings analysis of data from GreatSchools, the U.S. Census Bureau, the NCES, lawyers.com, and Pendall zoning database. Anti-density zoning index is only available for the 49 metros surveyed by the Pendall database. The zoning law firm index is measured for the metro area's state.

These data point to a significant "price" that restrictive zoning imposes in terms of housing costs and limiting access to high-scoring schools. If a metro area with extremely high scores on the Pendall anti-density zoning index like Buffalo or Boston had years ago adopted the more relaxed zoning laws of metro areas like San Diego or Portland, their estimated housing-cost gaps could be 63 percentage points lower today (which is more than one standard deviation). The estimate is similar but slightly smaller using the state zoning law firm index in a sample of all 100 metro areas, at 40 percentage points. That magnitude reduction in the housing-cost gap is associated with a 7.4 percentile-point narrowing of the school test-score gap between low-income and middle/high-income students for all schools, or 3.6 percentile points for elementary schools.[91]

To be sure, these hypothetical changes in zoning would not lead to an immediate boom in high-density, affordable housing in affluent neighborhoods. The association between zoning and housing has developed over decades. One can imagine new high-priced condos being built soon after a zoning change in a high-income neighborhood, but it often takes decades for housing to age long enough to become affordable for the poor.[92] In addition, these results do not take into account the potential for whites (or affluent people from any race) to move away in response to integration; recent research does imply that whites have responded negatively to school integration (by moving) when forced

through busing.[93] Yet Easterly finds that the share of whites living in neighborhoods stabilizes at moderate levels of diversity, suggesting that zoning changes could give disadvantaged groups longer-run access to higher-scoring schools than previous research may have suggested.[94]

Local level data

Recent surveys of land use regulation have established what the previous literature from the 1970s argued but rarely could prove nationally with adequate data. Exclusionary zoning laws work, in so far as they are designed to keep housing costs high, and the jurisdictions that use them the most aggressively have the following characteristics: 1) They have residents with relatively high incomes; 2) They have low population densities, implying that there is open space for potential development; 3) They have high home ownership rates, implying that there are fewer rental units available.[95]

These local zoning laws have implications for low-income and minority student access to high-scoring elementary schools. Table 7 reports the characteristics of 925 local jurisdictions in the Wharton land use survey, classified by the restrictiveness of their zoning. In the least regulated jurisdictions, relative to metropolitan averages, test scores and the shares of students that are low-income and black/Hispanics are similar, and annual housing costs are slightly cheaper. By contrast, in the most exclusionary jurisdictions, public elementary schools are ranked 16 percentage points higher on standardized state test scores than the metropolitan average; annual costs of renting a home or paying a mortgage are almost $4,000 higher; and disadvantaged students—whether low-income, black, or Hispanic—are under-represented by 17 or 18 percentage points.

Table 7. Housing and School Indicators by Level of Local Government Zoning Restrictions, 925 Jurisdictions in 100 Largest Metropolitan Areas

	Neighborhood housing costs in town relative to MSA	Town's elementary school test scores percentile relative to MSA	Percentage of elementary school students in poverty relative to MSA	Percentage of elementary school students who are black or Hispanic relative to MSA
Least exclusionary quintile of zoning	-$189	-0.1	0%	-4%
second quintile	$527	3.7	-4%	-9%
third quintile	$1,698	9.6	-10%	-12%
fourth quintile	$1,680	9.3	-9%	-13%
Most exclusionary quintile of zoning	$3,749	16.4	-17%	-18%

Source: Brookings analysis of data from Wharton zoning survey, GreatSchools, and U.S. Census Bureau. School test scores refer to the share of students at or above proficiency. Zoning is based on 925 local government observations in the 100 largest metropolitan areas. The zoning components analyzed include minimum lot size (in acres), and planner-reported answers to the question: how important are density restrictions on single and multi-family housing on a 1-5 scale. Poverty is defined as eligibility for free or reduced price lunch.

Table 8. Housing and Elementary School Characteristics, Towns with Most and Least Restrictive Zoning in Eastern Massachusetts

Town	County	Zoning restrictions on inexpensive housing (1-100 scale)	Percentile rank of average elementary school	Annual housing costs near schools	Low income share of elementary students	Black or Hispanic share of elementary students
Towns with most restrictions on inexpensive housing						
Sherborn	Middlesex County (MA)	100	94.0	$33,642	3%	3%
Lancaster	Worcester County (MA)	100	55.0	$17,758	16%	6%
Groton	Middlesex County (MA)	100	66.0	$25,523	2%	2%
Sudbury	Middlesex County (MA)	99	97.1	$31,060	3%	3%
Weston	Middlesex County (MA)	99	76.3	$33,918	5%	10%
Upton	Worcester County (MA)	98	51.0	$25,246	5%	3%
Bolton	Worcester County (MA)	98	92.0	$27,668	3%	2%
Tyngsborough	Middlesex County (MA)	98	52.0	$22,176	7%	4%
Dracut	Middlesex County (MA)	96	37.5	$13,543	16%	9%
Middleborough	Plymouth County (MA)	96	28.0	$13,988	27%	6%
Norfolk	Norfolk County (MA)	96	86.0	$24,924	4%	1%
Stow	Middlesex County (MA)	96	86.6	$26,295	3%	3%
Townsend	Middlesex County (MA)	96	33.0	$17,242	17%	3%
Group Average		**98**	**65.7**	**$24,076**	**9%**	**4%**
Towns with least restrictions on inexpensive housing						
Waltham	Middlesex County (MA)	16	31.9	$12,899	28%	38%
Hull	Plymouth County (MA)	15	46.0	$16,220	26%	1%
Revere	Suffolk County (MA)	9	30.4	$11,965	72%	45%
Worcester	Worcester County (MA)	9	18.2	$9,373	70%	52%
Lynn	Essex County (MA)	7	18.0	$11,666	79%	62%
Lawrence	Essex County (MA)	4	16.9	$7,023	88%	92%
Chelsea	Suffolk County (MA)	3	16.3	$8,320	94%	90%
Malden	Middlesex County (MA)	1	29.0	$12,984	51%	35%
Medford	Middlesex County (MA)	1	27.4	$12,784	31%	25%
Everett	Middlesex County (MA)	1	15.8	$10,187	72%	47%
Group Average		**7**	**25.0**	**$11,342**	**61%**	**49%**
Average for all towns in Eastern Massachusetts		**58**	**58.8**	**$19,443**	**17%**	**10%**

Source: Brookings analysis of data from GreatSchools, the National Center for Education Statistics, the U.S. Census Bureau, and the Massachusetts Housing Regulation Database. Housing costs refer to the average median housing costs in the census tracts near elementary schools, and may differ from broader measure of costs for the town. For 177 towns with complete data. Schools are ranked against all schools in the sample.

Many of the jurisdictions in the Wharton survey with highly exclusionary zoning have extremely expensive housing relative to the metropolitan average. These include: Wrightstown and Chads Ford in the Philadelphia suburbs; Ardsley in Westchester County, NY; Oakland in the Detroit suburbs; Fairfield in the Bridgeport region; Fairport east of Rochester, NY; Pearland outside of Houston; Lakeland near Memphis; and Solon outside of Cleveland. The shares of disadvantaged students enrolled in their schools are much lower, and school test scores much higher, than metropolitan averages. In many respects, these jurisdictions are the mirror image of their nearby central cities, which bear disproportionate burden for housing their regions' poor families and educating their children.

Data from the Boston region, described in the Methodology section, provide further evidence on the strong relationship between municipal zoning regulations, housing costs, and access to high-scoring schools. Massive differences exist in test scores, housing costs, and demographics between Eastern

Massachusetts towns that practice exclusionary zoning and those that do not (Table 8). On average, elementary school test scores are at the 66th percentile in the most restrictive group of jurisdictions, and at the 25th percentile in the least restrictive group of jurisdictions. Student populations are also radically different. Just 9 percent of elementary school students in the average highly restrictive town are low-income, compared to 61 percent in the least restrictive areas, and housing costs are almost $13,000 more per year where zoning is more restrictive.[96] Thus, it would be much more expensive to move from the jurisdictions in the bottom panel to those in the top panel than to pay tuition at the average Catholic school in the Boston metro area, which is just $4,477 per year for non-Catholics.[97]

More rigorous regression analysis confirms that these differences are statistically significant in the full sample, even controlling for the town's metropolitan location (centered on Boston, Providence, or Worcester). Higher priced areas have better test scores and fewer disadvantaged students, and these associations remain significant when zoning is used to predict housing prices.[98]

Discussion and Conclusion

This analysis documents that the average schools attended by low-income students, black students, and Hispanic students register much lower scores on state standardized exams than average schools attended by middle/high-income and white students. In light of mounting evidence that disadvantaged students perform better when they attend school with higher-performing peers, and that young minority adults do better in labor markets with more integrated schools, the school test-score gap may very well represent a serious obstacle to boosting student achievement and promoting economic security.

Access to high-scoring schools is unequal by income and race because that access is constrained by housing availability and cost. The housing-cost gaps between neighborhoods with high-scoring and low-scoring schools revealed here confirm that it is financially impossible for many working-poor families to access high-scoring schools in the absence of lottery systems or other aggressive district efforts to integrate schools. For many families, it would be cheaper to send a child to a parochial or even more expensive private school than to move into the attendance zone of a high-scoring school.

This report also looks behind the housing-cost gap to examine why neighborhoods remain segregated by race and income and how that impedes broader access to good schools. Discriminatory zoning that forbids the construction or use of inexpensive housing in affluent neighborhoods is still widespread in metropolitan America. Just as explicitly race-based policies like covenants and discriminatory lending and real estate standards contravened market forces to keep blacks out of white neighborhoods, zoning today keeps poor people out of rich neighborhoods, and accounts for a significant portion of the school test-score gap between low-income and other children.

The issue of school inequality is linked, of course, to overall economic inequality. Children of less-educated parents miss out on important familial advantages and they are less likely to attend high-scoring public schools because their parents cannot afford to live near high-scoring public schools or pay private school tuition. Public policies that foster the growth of jobs that are disproportionately available to less educated workers and pay decent wages—like in production, construction, installation, and transportation—could erase some of this educational disadvantage.[99]

There are also more direct ways to promote school integration by income and race. States and school districts across the country are experimenting with a number of different strategies. For a thorough review of policies designed to explicitly promote integration see Richard Kahlenberg's recent paper on efforts to promote integration through "controlled choice."[100] Take one promising plan in which the Cambridge, MA school district treats every school as a magnet school. Parents then list their top school choices for their children, and the district creates an assignment formula that maximizes parental choice while insuring that schools are at least somewhat balanced in terms of their distribution of low-income students.[101]

Other approaches seek to expand school choice for low-income students through charter schools, school vouchers, or the elimination of attendance boundaries. The National Alliance for Public Charter Schools reports that over 2 million students were enrolled in charter schools as of the 2010-2011 school year, and only nine state have no laws authorizing charter schools.[102] Some recent research

finds that increasing school attendance options for middle/high income students through charters can lead to increased racial or economic segregation.[103]

As many as 27 private voucher programs are run by philanthropic organizations around the country paying tuition for an estimated 210,000 disadvantaged students.[104] In Louisville, for example, School Choice Scholarships pays for a few hundred poor students to attend private schools.[105] Likewise, the public sector also provides vouchers to attend private schools in some states, like Wisconsin, through the Milwaukee Parental Choice Program, and the federal government provides scholarships to poor DC residents, through the Opportunity Scholarships Program.[106]

A more sweeping proposal has been put forth recently to combine the above reforms with increased choice within the traditional public school system. Led by the federal government, school funding could be linked to individual children rather than schools, such that a child could apply to multiple public schools in his or her area.[107]

Another set of reform ideas focus on administrative issues like mayoral control of school systems or teacher incentives. In some areas like Washington, DC and New Haven, CT, union leaders have worked with reformers to link teacher pay, promotion, and retention decisions with objective performance measures, with the goal of improving the quality of under-performing schools.

All of these reform strategies have one thing in common: They try to improve disadvantaged students' access to high-performing schools through education policy. These reform ideas certainly have merit and should be carefully evaluated and considered, but they do not address one very important mechanism that sorts poor students into the lowest-scoring schools: housing policy. Housing and education policies should work together to promote access to improved school environments for low-income and minority children.[108]

The most ambitious and consequential policy reform along these lines would be to eliminate exclusionary zoning altogether. In an ideal world, the federal government or states would forbid local governments from discriminating based on housing type (e.g. single-family attached or multi-family) or size (lot, floor, or frontage size). They could even agree to compensate jurisdictions for any disproportionate increases in local expenditures that resulted from higher density or lower-income development. Eliminating exclusionary zoning laws could produce large educational and economic benefits for low-income and minority children and families, and the U.S. economy as a whole. Unfortunately, the likelihood of such a reform, however market-oriented it may be, seems low at this time.

In the absence of aggressive federal or state action of that kind, modest but meaningful policy options exist to promote disadvantaged families' access to better neighborhoods and schools. One policy mechanism to increase residential, and thereby school, integration is expanded portability of housing vouchers. Recent research from Brookings has shown that vouchers help poor families live in less poor and more job-rich neighborhoods.[109] Yet, as the MTO experiment showed, vouchers often fall short of promoting economic and racial integration, especially in an otherwise segregated metropolitan area where many affluent suburbs do not even allow rental housing. This report's results indicate that in many metro areas, vouchers would have to be very generous to cover the large price premium for living in neighborhoods near top-performing schools.

State and local governments are also experimenting with several tools to increase economic integration through housing and land use policies. The Center for Housing Policy provides many examples. One is to create enforceable "rights" to develop affordable housing in towns that are not providing their fair share.[110] As used by New Jersey, Massachusetts, and New Hampshire, this allows developers to challenge denials in court in an expedited manner. California obligates municipalities to include planning for affordable housing in their zoning laws. At the local level, cities or towns can mandate that new construction include a certain share of affordable units or, as in New York, developers can be rewarded with a "density bonus," if they include more affordable units.[111]

Unfortunately, inclusionary zoning and various other pro-affordable housing policies must co-exist with more powerful and sweeping laws that block affordable housing (or even future inexpensive housing) where it is most needed. So long as homeowners living in affluent suburbs can continue to benefit from the density of cities (where they often work or find business relations), without accepting the higher costs of public services to support it, they will continue to block the construction of inexpensive housing in their jurisdictions.

At the regional scale, improved zoning coordination could be used to promote higher density where it makes sense. That is, for some metros, currently low-dense areas may be conveniently located near job centers or existing public transit routes, and thus, the region would benefit by allowing more people to live there. Portland, Oregon has taken such a regional approach to planning by limiting developments in outer suburbs. This is one of the reasons why segregation has fallen in Portland, according to a recent study, and may partly account for its low test score gap observed here.[112] However, there is no evidence that Portland's specific "containment" regulations yield better results than simply allowing market forces to allocate high-density development.

To conclude, across the private, non-profit, and public sectors, there are many compelling efforts to improve the quality of education available to low-income children. In documenting the tight link between housing costs and access to high-scoring schools, this report illustrates the scale of the challenge, and yet, it also shows that reforms to housing and land use policy could have potentially large benefits to the nation's future by making educational opportunity more equal.

Endnotes

1. David Card, "The Causal Effect of Education on Earnings," In Orley Ashenfelter and David Card, eds. Handbook of Labor Economics, vol. 3A (Amsterdam: Elsevier, 1999); Enrico Moretti, "Human Capital Externalities in Cities," In Vernon J. Henderson and Jacques-Francois Thisse, eds. *Handbook of Regional and Urban Economics*, vol. 4 (Amsterdam: Elsevier, 2004); Jian Huang, Henriette Massen van den Brink, and Wim Groot, "A Meta-analysis of the Effect of Education on Social Capital," *Economics of Education Review* 28 (4) (2009): 454-464; David Cutler and Adriana Lleras-Muney, "Education and Health: Evaluating Theories and Evidence," In Robert Schoeni, ed., *Making Americans Healthier: Social and Economic Policy as Health Policy* (New York: Russell Sage Foundation, 2008).

2. David Card, "The Causal Effect of Education on Earnings."

3. Ibid; Lisa Barrow and Cecilia Rouse, "Do Returns to Schooling Differ by Race and Ethnicity," *American Economic Review*, 95 (2) (2005): 83-87.

4. Edward L. Glaeser and others, "Do Institutions Cause Growth?" *Journal of Economic Growth* 9 (2004): 271-303; N. Gregory Mankiw, David Romer, and David Weil, "A Contribution to the Empirics of Economics Growth" *Quarterly Journal of Economics* 107 (2) (1992): 407-437. Moretti, "Human Capital Externalities in Cities." Huang, Massen van den Brink, and Groot, "A Meta-analysis of the Effect of Education on Social Capital." Edward L. Glaeser and Albert Saiz, "The Rise of the Skilled City," Brookings-Wharton Papers on Urban Affairs (2004): 47-94. Jonathan Rothwell, "The Effects of Racial Segregation on Trust and Volunteering in U.S. Cities," *Urban Studies* (Forthcoming, 2011).

5. Brookings analysis of data from the 2010 American Community Survey.

6. Sean F. Reardon, "The Widening Academic Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations," In Richard Murnane and Greg Duncan eds., *Whither Opportunity? Rising Inequality and the Uncertain Life Chances of Low-Income Children* (New York: Russell Sage Foundation, 2011).

7. Anthony Carnevale and Jeff Strohl, "How Increasing College Access is Increasing Inequality, and What to Do About it," In Richard Kahlenberg, ed., *Rewarding Strivers: Helping Low-Income Students Succeed in College* (New York: The Century Foundation, 2010).

8. Ibid, p 137. Also see William Bowen, Matthew Chingos, and Michael McPherson, *Crossing the Finish Line: Completing College at America's Public Universities* (Princeton, N.J.: Princeton University Press, 2009).

9. Roland Fryer and Stephen Levitt, "Testing for Racial Differences in the Mental Ability of Young Children," forthcoming in *American Economic Review* (2012); James Flynn, "Searching for Justice: The Discovery of IQ Gains Over Time," *American Psychologist* 54 (1) (1999): 5-20.

10. Alan Krueger, Jesse Rothstein, and Sarah Turner, "Race, Income, and College in 25 Years: Evaluating Justice O'Connor's Conjecture," *American Law and Economics Review* 8 (2) 2006: (282–311); Julie Cullen, Brian Jacob, and Steven Levitt, "The Effect of School Choice on Participants: Evidence from Randomized Lotteries," *Econometrica*, 74 (5) (2006), 1191-1230.

11. James R. Coleman "Equality of Educational Opportunity" (Washington: Office of Education, 1966), p 21.

12. Roland Fryer and Steven Levitt, "The Black-White Test Score Gap Through Third Grade," *American Law and Economics Review*, 8 (2) (2006): 249–281.

13. Jonathan Guryan, Erik Hurst, Melissa Kearney, "Parental Education and Parental Time with Children" *Journal of Economic Perspectives* 22 (3) (2008): 23-46.

14. Andrew J. Houtenville and Karen Smith Conway, "Parental Effort, School Resources, and Student Achievement." *Journal of Human Resources* 43 (2) (2008): 437-453.

15. Betty Hart and Todd R. Risley, "The Early Catastrophe: The 30 Million Word Gap by Age 3," *American Educator* 27 (1) (2003): 4-9.

16. Julia B. Issacs, "Starting School at a Disadvantage: The School Readiness of Poor Children" (Washington: Brookings Institution, 2012).

17. Kevin M. Murphy and Sam Peltzman, "School Performance and the Youth Labor Market, *Journal of Labor Economics* 22 (2) (2004): 299-327; Julian Betts, "Does School Quality Matter? Evidence from the National Longitudinal Survey of Youth," *The Review of Economics and Statistics*, 77 (2) (1995):231-250; Caroline M. Hoxby, "Peer Effects in the Classroom: Learning from Gender and Race Variation," Working Paper 7867 (National Bureau of Economic Research, 2000); Bruce Sacerdote, "Peer Effects with Random Assignment: Results for Dartmouth Roommates," *The Quarterly Journal of Economics* 116 (2) (2001): 681-704: Mary A. Burke and Tim R. Sass, "Classroom Peer Effects and Student Achievement," (Washington: Urban Institute, 2008); Eric A. Hanushek, John F. Kain, Jacob M. Markman, and Steven G. Rivkin, "Does the Ability of Peers Affect Student Achievement?" *Journal of Applied Economics* 18 (5) (2003): 527-544; Raj Chetty and others, "How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR," *Quarterly Journal of Economics* 126 (4) (2011): 1593-1660; Raj Chetty, John N. Friedman, Jonah E. Rockoff, "The Long-Term Impacts of Teachers: Teacher Value-Added And Student Outcomes In Adulthood," Working Paper (Harvard University, 2011); Jonah E. Rockoff, "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data" *American Economic Review* 94 (2) (2004):247-252; Charles Clotfelter, Helen Ladd, and Jacob Vigdor, "How and Why Do Teacher Credentials Matter to Student Achievement?" Working Paper 2 (Urban Institute National Center for Longitudinal Analysis of Education Research, 2007). David Deming, "Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start." *American Economic Journal: Applied Economics* 1 (3) (2009): 111-134; James Heckman, Seong Hyeok Moon, Rodrigo Pinto, Peter Savelyev, and Adam Yavitz, "Analyzing Social Experiments as Implemented: A Reexamination of the Evidence from the HighScope Perry Preschool Program." *Quantitative Economics* 1 (1) (2010): 1-46; David Deming and others, "School Choice, School Quality and Postsecondary Attainment" Working Paper 17438 (National Bureau of Economic Research, 2011).

18. Atila Abdulkadiroglu and others. "Accountability and Flexibility in Public Schools: Evidence from Boston's Charters and Pilots," Quarterly Journal of Economics 126 (2) (2011): 699-748; Joshua D. Angrist and others, "Inputs and Impacts in Charter Schools: KIPP Lynn," *American Economic Review* 100 (2) (2010): 239-243; Caroline Hoxby and Jonah Rockoff, "The Truth about Charter Schools: Findings from the City of Big Shoulders," *Education Next* (2005); Paul E. Peterson and William G. Howell, *The Education Gap Vouchers and Urban Schools* (Washington: Brookings Institution Press, 2006). Paul Peterson, William Howell, Patrick J. Wolf, and David Campbell, "School Vouchers. Results from Randomized Experiments," In ed., Caroline M. Hoxby, *The Economics of School Choice* (Chicago: University of Chicago Press, 2003).

19. Julie Berry Cullen, Brian A. Jacob, and Steven Levitt, "The Effect of School Choice on Participants: Evidence From Randomized Lotteries," *Econometrica* (74) (5) (2006): 1191–1230.

20. Steven Rivkin and Finis Welch, "Has School Desegregation Improved Academic and Economic Outcomes for Blacks?" In Eric Hanushek and Finis Welch, ed. *Handbook of the Economics of Education*, vol. 2 (Elsevier: 2006). Jonathan Guryan, "Desegregation and Black Dropout Rates," *American Economic Review*, 94 (4) (2004): 919-943; Rucker C. Johnson, "Long-Run Impacts of School Desegregation and School Quality on Adult Attainments," Working Paper 16664 (National Bureau of Economic Research, 2011).

21. Jason Fletcher and Marta Tienda, "Race and Ethnic Differences in College Achievement: Does High School Attended Matter?" *Annals of the American Academy of Political and Social Science*, 627 (2010): 144-66; Will Dobbie and Roland G. Fryer, Jr. "Are High-Quality Schools Enough to Increase Achievement Among the Poor? Evidence from the Harlem Children's Zone," *American Economic Journal: Applied Economics* 3 (3) (2011): 158-187.

22. Justine Hastings and Jeffrey Weinstein, "Information, School Choice, and Academic Achievement: Evidence from Two Experiments," *Quarterly Journal of Economics*, 123 (4) (2008): 1373-1414.

23. Ibid.

24. John Logan, "Whose Schools are Failing?" (Providence: Brown University US 2010, 2011).

25. Sean F. Reardon, "The Widening Academic Achievement Gap Between the Rich and the Poor: New Evidence and Possible Explanations" in Richard Murnane and Greg Duncan, eds., *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances* (New York: Russell Sage Foundation, 2011).

26. David Card and Jesse Rothstein, "Racial Segregation and the Black-White Test Score Gap," *Journal of Public Economics*, 91 (11-12) (2007): 2158-2184.

27. David M. Cutler and Edward L. Glaeser, "Are Ghettos Good or Bad?" *Quarterly Journal of Economics* 112 (3) (1997): 827-872.

28. Douglas S. Massey, "Social Background and Academic Performance Differentials: White and Minority Students at Selective Colleges," *American Law and Economics Review* 8 (2) (2006): 390–409.

29. Robert J. Sampson, Jeffrey D. Morenoff and Thomas Gannon-Rowley, "Assessing "Neighborhood Effects": Social Processes and New Directions in Research," *Annual Review of Sociology* 28 (2002): 443-478.

30. James E. Rosenbaum, "Changing the geography of opportunity by expanding residential choice: Lessons from the Gautreaux program," Housing Policy Debate 6 (1995): 231-269.

31. Ibid.

32. Lawrence Katz, Jeffrey Kling, and Jeffrey Liebman, "Experimental Analysis of Neighborhood Effects," *Econometrica* 75 (1) (2007): 83-119.

33. Susan Clampet-Lundquist and Douglas S. Massey, "Neighborhood Effects on Economic Self-Sufficiency: A Reconsideration of the Moving to Opportunity Experiment." *American Journal of Sociology* 114 (1) (2008): 107–143.

34. Jens Ludwig and others, "What Can We Learn about Neighborhood Effects from the Moving to Opportunity Experiment? *American Journal of Sociology* 114 (1) (2008): 144–188.

35. Lisa Sanbonmatsu, Jeffrey R. Kling, Greg J. Duncan, and Jeanne Brooks-Gunn, "Neighborhoods and Academic Achievement: Results from the Moving to Opportunity Experiment" *The Journal of Human Resources* 41 (4) (2006): 649-691.

36. Geoffrey T. Wodtke, David J. Harding, and Felix Elwert, "Neighborhood Effects in Temporal Perspective: The Impact of Long-Term Exposure to Concentrated Disadvantage on High School Graduation," *American Sociological Review* 76 (5) (2011): 713-736.

37. Sandra E. Black, "Do Better Schools Matter? Parental Valuation of Elementary Education," *Quarterly Journal of Economics* 114 (2) (1999): 577-599.

38. Heather Schwartz, "Housing Policy Is School Policy: Economically Integrative Housing Promotes Academic Success in Montgomery County, Maryland" (New York: The Century Foundation, 2010).

39. Rebecca Casciano and Douglas Massey, "School Context and Educational Outcomes: Results from a Quasi-Experimental Study," *Urban Affairs Review* 48 (2) (2012): 180-204.

40. Eric A. Hanushek and Kuzey Yilmaz, "Land Use Controls and the Provision of Education," Working Paper 17730 (National Bureau of Economic Research, 2012).

41. William Fischel, "Do Growth Controls Matter?" Working Paper 87-9 (Cambridge: Lincoln Institute of Land Policy, 1990); Edward L. Glaeser and Joseph Gyourko and Raven Saks, "Why Have Housing Prices Gone Up?" *American Economic Review*, 95 (2) (2005), 329-333; Edward Glaeser and Joseph Gyourko, "The Impact of Zoning on Housing Affordability." *Economic Policy Review* (2) (2003): 21–39.

42. Edward L. Glaeser and Bryce Ward, "The Causes and Consequences of Land Use Regulation: Evidence from Greater Boston," *Journal of Urban Economics* 65 (3) (2009): 265-278; Jonathan Rothwell, "Density Regulation and Metropolitan Housing Markets," *Working Paper* 1154146 (Social Science Research Network, 2009).

43. Rolf Pendall, "Local Land Use Regulation and the Chain of Exclusion" *Journal of the American Planning Association* 66 (2) (2000):125-142; Douglas S. Massey, Jonathan Rothwell, and Thurston Domina, "The Changing Bases of Segregation in the United States" *The Annals of the American Academy of Political and Social Science* 629 (1) (2009): 74-90; Jonathan Rothwell and Douglass S. Massey, "The Effect of Density Zoning on Racial Segregation in U.S. Urban Areas," *Urban Affairs Review* 44 (6) (2009):

779-806; Jonathan Rothwell "Racial Enclaves and Density Zoning: The Institutionalized Segregation of Racial Minorities in the United States," *American Law and Economics Review* 13 (1) (2011): 290-358; Jonathan Rothwell and Douglas Massey, "Density Zoning and Class Segregation in U.S. Metropolitan Areas" *Social Science Quarterly* 91 (5) (2010): 1123-1143.

44. Rothwell "Racial Enclaves and Density Zoning;" Rothwell and Massey, "Density Zoning and Class Segregation in U.S. Metropolitan Areas."

45. United States National Commission on Urban Problems, Building the American city: Report to the Congress and to the President of the United States (Washington: U.S. Government Printing Office, 1969).

46. Douglas S. Massey and Nancy A. Denton, American Apartheid: Segregation and the Making of the Underclass (Cambridge: Harvard University Press, 1993); David Cutler, Edward Glaeser, and Jacob Vigdor, "The Rise and Decline of the American Ghetto" *Journal of Political Economy* 107 (3) (1999): 455–506.

47. United States National Commission on Urban Problems, 1969.

48. Buchanan v. Warley., 245 U.S. 60 (1917).

49. Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985).

50. United States National Commission on Urban Problems, 1969.

51. United States National Commission on Urban Problems, 1969, p 208-209.

52. Robert E. Hirshon, "The Interrelationship Between Exclusionary Zoning And Exclusionary Subdivision Control," *University of Michigan Journal of Law Reform* 5 (1971-1972): 351-360.

53. R. Robert Linowes and Don T. Allensworth, *The Politics of Land Use: Planning, Zoning, and the Private Developer* (New York: Praeger, 1973).

54. Ibid.

55. *Southern Burlington County NAACP v. Township of Mount Laurel*, 336, A. 2d 713 (N.J. 1975).

56. James L. Mitchell, "Will Empowering Developers to Challenge Exclusionary Zoning Increase Suburban Housing Choice?" *Journal of Policy Analysis and Management*, 23 (1) (2004): 119–134; *Surrick vs. Zoning Hearing Board* 382 A.2d 105 (Pa. 1977). Katrin C. Rowan, "Anti-Exclusionary Zoning In Pennsylvania: A Weapon For Developers, A Loss For Low income Pennsylvanians" *Temple Law Review* 80 (4) (2007) 1271–1304.

57. Leah Platt Boustan, "School Desegregation and Urban Change: Evidence from City Boundaries," *American Economic Journal: Applied Economics* 4 (1) (2012): 85–108.

58. *Village of Arlington Heights v. Metropolitan Housing Development Corp*, 429 U.S. 252 (1977).

59. Marsha Ritzdorf, "Locked Out of Paradise: Contemporary Exclusionary Zoning, the Supreme Court, and African Americans, 1970 to the Present," in June Manning Thomas and Marsha Ritzdorf, eds. *Urban Planning and the African American Community in the Shadows* (Thousand Oaks, CA: Sage Publications, 1997).

60. Rachel Fox, "The Selling Out of Mount Laurel: Regional Contribution Agreements in New Jersey's Fair Housing Act" *Fordham Urban Law Journal* 16 (4) (1987): 535-572.

61. Rick Cohen, "N.J.'s "Mount Laurel" Fair Share Housing Programs at Risk" *Nonprofit Quarterly*, January 13, 2012.

62. Editorial, "Westchester's Desegregation Battle" *The New York Times*, December 31, 2011.

63. 91 percent of schools reported test scores as late as 2010 or 2011 (with 56 percent in 2011). The earliest were in 2006, with just 0.1 percent of the total. For elementary grade test scores—which comprised most of the housing cost calculations—97 percent of the observations came from 2010. High schools were more likely to have reported 2011 scores.

64. U.S. Department of Agriculture Food and Nutrition Service, *Income Eligibility Guidelines*, available at http://www.fns.usda.gov/cnd/Governance/notices/iegs/IEGs.htm (February 2012).

65. There are two ways a child can be eligible for the free or reduced price lunch program, through family income or category. By income, a child's parents must have a combined income less than or equal to 1.85 time the federal poverty line for their family size. To be eligible categorically, a school administer must verify that the child's family is participating in other poverty-assistance programs or meets a limited number of other conditions associated

with deprivation, such as being homeless. Details can be found at the USDA National Lunch Program website, available here, http://www.fns.usda.gov/cnd/lunch/, (April 2012).

66. IFF, "Quality Schools: Every Child, Every School, Every Neighborhood: An Analysis of School Location and Performance in Washington, DC," DC Public Education Fund, 2012); Maja Vouk and Chuck Dulaney, "Distance from Student Residence to School Academic Year 2006-07" (Wake County North Carolina: Wake County School System Demographics, 2009); See Table 6 from: The National Center for Safe Routes to School, "How Children Get to School: School Travel Patterns from 1969 to 2009" (Washington: U.S. Department of Transportation, 2011). Available at http://www.saferoutesinfo.org/program-tools/NHTS-school-travel-1969-2009 (March 2012).

67. This analysis finds that only 24 percent of residential addresses in the school's zip code are captured by the school's geocoded census tract. While zip codes are not akin to attendance zones, they do represent practical delivery routes for the U.S. Postal Services. The fact that so few residential addresses within a school's zip code are captured by the school's census tract implies that many nearby homes are outside of the tract and would have only a short commute to the school.

68. Rolf Pendall, Robert Puentes, and Jonathan Martin, "From Traditional to Reformed: A Review of the Land Use Regulations in the Nation's 50 Largest Metropolitan Areas," (Washington: The Brookings Institution, 2006).

69. Available at http://www.lawyers.com/find-a-lawyer.html (March 2012).

70. Joseph Gyourko, Albert Saiz and Anita Summers, "A New Measure of the Local Regulatory Environment for Housing Markets: The Wharton Residential Land Use Regulatory Index," *Urban Studies* 45 (3) (2008), 693-729.

71. Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston. 2005. Massachusetts Housing Regulation Database. Prepared by Amy Dain and Jenny Schuetz.

72. Housing Regulation Database, available at http://www.masshousingregulations.com/dataandreports.asp (January 2012).

73. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

74. For each school, the share of students who score at or above grade level was subtracted from the state average for that subject, year, and grade level. This adjusted difference was then averaged for each school across grades and subjects. The average enrollment-weighted black student attends schools that are 7.5 percentage points below the state mean; Hispanics attend schools 4.3 percentage points below; free and reduced lunch eligible students attend schools 4.2 points below the state mean, and for whites, it is 4.9 points above the mean. The standard deviation, weighted by school enrollment, is 14.5.

75. Data from 1998 (the earliest available on the NCES website) to 2010 show that even as black students became slightly less racially, their exposure to poor students increased from 44 percent to 53 percent. In fact, all groups of students except Asians saw an increase in exposure to the poor, including poor (free lunch eligible students).

76. Hastings and Weinstein, "Information, School Choice, and Academic Achievement;" Chetty and others, "How Does Your Kindergarten Classroom Affect Your Earnings?" Guryan, "Desegregation and Black Dropout Rates;" Johnson, "Long-Run Impacts of School Desegregation and School Quality on Adult Attainments."

77. Chetty and others, "The Long-Term Impacts of Teachers."

78. Charles Clotfelter, Helen Ladd, and Jacob Vigdor. "Who Teaches Whom? Race and the Distribution of Novice Teachers." *Economics of Education Review*, 24 (2005): 377-392.

79. Brookings analysis of California Department of Education 2010 Base Academic Performance Index (API) Data File and 2010 Staff Demographic data file. Test scores were predicted as a function of student demographics and poverty status. Details are available upon request. To give one example, in California public schools in 2010, the average black student attends a school in which the average teacher has 1.6 years less experience than those teacher white students HELP here? This represents a gap of almost 0.5 standard deviations.

80. Indeed, even adding the cost of living near the school and the size of the average house near the school does not significantly change the result, though doing so reduces the implied effect to 0.5 percentage points. Results are available upon request. The analysis uses roughly 38,000 schools where data were available. The author thanks Matthew Chingos for suggesting that housing costs be added to the regression to proxy for parental advantage.

81. This relationship holds whether or not one looks specifically at gaps between whites and minorities and whether or not one adjusts metropolitan areas for other characteristics like the share of residents from disadvantaged backgrounds.

82. Richard D. Kahlenberg, "Rescuing Brown v. Board of Education: Profiles of Twelve School Districts Pursuing Socioeconomic School Integration," (New York, The Century Foundation, 2007).

83. To be sure, people are not randomly assigned to metropolitan areas, so this analysis cannot control for unobservable characteristics that may differentiate residents of metro areas with high or low average test scores for minority students.

84. Hastings and Weinstein, "Information, School Choice, and Academic Achievement."

85. Table 63, Digest of Education Statistics 2010, National Center for Educational Statistics, available at http://nces.ed.gov/programs/digest/d10/tables/dt10_063.asp (February 2012).

86. Melissa A Cidade and C. Joseph O'Hara, "Financing the Mission: A Profile of Catholic Elementary Schools in the United States, 2011" (Washington: National Catholic Education Association, 2012). NCEA data did not include test scores for the Catholic schools, and it is unlikely that all of them would be in the top quintile of standardized test score performance. Still, some research finds that Catholic schools outperform public schools, and minority students are mostly likely to benefit (even adjusting for non-random sorting). Derek Neal, "The Effect of Catholic Secondary Schooling on Educational Attainment," *Journal of Labor Economics* 15 (1) (1997): 98-123; Joseph G. Altonji, Todd E. Elder and Christopher R. Taber, "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools," *Journal of Political Economy* 113 (1) (2005): 151-184; Anh Ngoc Nguyen, Jim Taylor and Steve Bradley, "The Estimated Effect Of Catholic Schooling On Educational Outcomes Using Propensity Score Matching" *Bulletin of Economic Research* 58 (4) (2006): 0307-3378.

87. William A. Fischel, "An Economic History of Zoning and a Cure for Its Exclusionary Effects," (Department of Economics at Dartmouth College, 2001), available at http://www.dartmouth.edu/~wfischel/Papers/02-03.pdf (February 2012).

88. Gyourko, Saiz and Summers, "A New Measure of the Local Regulatory Environment for Housing Markets".

89. U.S. Census Bureau, "American Housing Survey for the United States: 2009" (Washington: U.S. Government Printing Office, 2009).

90. The correlation between zoning (using either measure) and the school premium remains significant after controlling for a number of potentially confounding variables correlated with both housing costs and zoning, such as population density, the share of blacks and Hispanics in the metropolitan population, median household income, college degree attainment, and income inequality, measured by the Gini coefficient.

91. The standard deviation across all metros on the test score gap is 7.7 (for both elementary and all schools), so the zoning effect is equal to roughly one half to one standard deviation. This part of the analysis uses zoning as an instrumental variable for the housing premium for top-performing schools to estimate the premium's "causal" effect on school inequality. For this to be valid, zoning must significantly predict the housing premium and have no effect on school inequality except through the housing premium—that is through housing segregation. The methods appendix describes the analysis conducted for these results in more detail. These results do not prove that zoning causes prices changes, and that these changes cause larger gaps in school quality. To do that, one would need a natural experiment, in which towns were randomly assigned zoning laws. To simulate such an experiment with limited data is very difficult, but as the appendix relates, year of statehood and the degree to which the metropolitan area has rural settlements are both factors that are highly correlated with zoning. In so far as using these measures to assign zoning to metropolitan areas is random with respect to home prices, the analysis suggests a causal link. See appendix for discussion.

92. Jan K. Brueckner and Stuart S. Rosenthal, "Gentrification and Neighborhood Housing Cycles: Will America's Future Downtowns Be Rich?" 91 (4) (2009):725-743.

93. Leah Platt Boustan, "School Desegregation and Urban Change: Evidence from City Boundaries." American Economic Journal: Applied Economics, 4 (1) (2012): 85–108.

94. William Easterly, "Empirics of Strategic Interdependence: The Case of the Racial Tipping Point," *The B.E. Journal of Macroeconomics* 9 (1) (2009).

95. Joseph Gyourko, Albert Saiz and Anita Summers, "A New Measure of the Local Regulatory Environment for Housing Markets: The Wharton Residential Land Use Regulatory Index," *Urban Studies* 45 (3) (2008), 693-729;

Rolf Pendall, Robert Puentes, and Jonathan Martin, "From Traditional to Reformed: A Review of the Land Use Regulations in the Nation's 50 largest Metropolitan Areas," (Washington: The Brookings Institution, 2006).

96. A regression analysis of zoning on housing costs was performed using the full database and controlling for metropolitan area effects, every decide of zoning adds $800 in housing costs. The correlation is highly significant.

97. Cite NCEA here.

98. An analysis performed with these data finds that housing strongly predicts the share of disadvantaged students in the town, when mediated by zoning, which was used as an instrumental variable. Results are available from the author upon request. Historical analyses of these data by economists suggest that zoning is the cause of higher prices, not the other way around. Glaeser and Ward, "The causes and consequences of land use regulation."

99. Mark Muro, Jonathan Rothwell, and Devashree Saha, "Sizing the Clean Economy: A National and Regional Green Jobs Assessment" (Washington: Brookings Institution, 2011); Emilia Istrate, Jonathan Rothwell, and Bruce Katz, "Export Nation: How U.S. Metros Lead National Export Growth and Boost Competitiveness" (Washington: Brookings Institution, 2010).

100. Richard D. Kahlenberg, "Rescuing Brown v. Board of Education: Profiles of Twelve School Districts Pursuing Socioeconomic School Integration," (New York, The Century Foundation, 2007); Richard Kahlenberg, "Turnaround Schools and Charter Schools that Work: Moving Beyond Separate But Equal," In Richard Kahlenberg, ed. *The Future of School Integration: Socioeconomic Integration as a Reform Strategy* (New York: Century Foundation Press, 2012).

101. Ibid.

102. National Alliance for Public Charter Schools, "A New Model Law For Supporting The Growth Of High-Quality Public Charter Schools" (Washington, 2009); NAPCS, *Measuring up to the Model: A Tool for Comparing State Charter School Laws*, available at http://www.publiccharters.org/Law/ (February 2012); *Number of Public Charter School Students in U.S. Surpasses Two Million*, available at http://www.publiccharters.org/pressreleasepublic/default.aspx?id=643 (March 2012).

103. Robert Bifulco and Helen F. Ladd. "School Choice, Racial Segregation, and Test-Score Gaps: Evidence from North Carolina's Charter School Program." *Journal of Policy Analysis and Management* 26.1 (2007): 31-56; Eric Brunner, Jennifer Imazeki, and Stephen Ross, "Universal Vouchers and Racial and Ethnic Segregation," *Review of Economics and Statistics* 92 (4) (2010): 912-927.

104. Alliance for School Choice, available at http://www.allianceforschoolchoice.org/school-choice-facts (April 2012).

105. School Choice Scholarships, available at http://www.schoolchoiceky.org/who-can-apply (February 2012).

106. Wisconsin Department of Public Instruction, Milwaukee Parental Choice Program, available at http://dpi.wi.gov/sms/geninfo.html (April 2012); DC Opportunity Scholarships Program, http://www.dcscholarships.org/news/default.asp (April 2012).

107. Koret Task Force on K-12 Education, "Choice and Federalism: Defining the Federal Role in Education" (Stanford: The Hoover Institution, 2012); Grover Whitehurst, "Let the Dollars Follow the Child: How the Federal Government can Achieve Equity," *Education Next* 12 (2) (2012).

108. Margery Austin Turner and Alan Berube, "Vibrant Neighborhoods, Successful Schools: What the Federal Government Can Do to Foster Both" (Washington: Urban Institute, 2009).

109. Kenya Covington, Lance Freeman, and Michael A. Stoll, "The Suburbanization of Housing Choice Voucher Recipients," (Washington: The Brookings Institution, 2011).

110. For discussion of this and other tools see Center for Housing Policy http://www.housingpolicy.org/toolbox/state_roles.html#2 (March 2012).

111. Center for Housing Policy, http://www.housingpolicy.org/toolbox/strategy/policies/inclusionary_zoning.html?tierid=116#1 (March 2012).

112. Arthur Nelson, Thomas Sanchez, and Casey Dawkins, "The effect of urban containment and mandatory housing elements on racial segregation in U.S. metropolitan areas, 1990–2000." *Journal of Urban Affairs* 26 (2004): 339–50.

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Methodological Appendix for Housing Costs, Zoning, and Access to High-Scoring Schools

By Jonathan Rothwell

This document provides methodological detail for the Brookings Metropolitan Policy Program publication "Housing Costs, Zoning, and Access to High-Scoring Schools." See the Brookings website for the full report.

School Quality

The measure of school quality used in this study is the percentage of students scoring at or above proficiency, according to state-specific tests. The test score data were purchased from GreatSchools, which collects test score data for public schools from various state sources.[1] The final database had 84,077 schools, out of a total of 99,806 listed by the National Center for Education Statistics.[2] 273 schools were missing demographic data for all racial groups, but thousands were missing data on native Hawaiian enrollment. For that reason, schools with missing Hawaiian enrollment were assigned a value of zero for that group, but no other missing values were imputed.

School proficiency does not isolate the advantage or disadvantage of being at a specific school for a child, but does provide an important general indicator of how well students perform at that school.[3] The analysis assumes that test scores are determined through a combination of factors that operate at the school level, the family and neighborhood level, and the individual level. With that said, school test scores are the most salient measure available on how well a given student is likely to perform who is enrolled in that school.

This study analyzes test scores for public schools only, as the data were not available for private schools. This clearly leaves out a large number of schools, but the percentage of students that attend private schools is very small. In the 2009-2010 school year, Brookings analysis of data from the NCES shows that 91 percent of students in the United States (enrolled from Kindergarten through high school) attend public schools. The share attending public school is slightly less for whites, at 90 percent, and very high for blacks and Hispanics, at 96 percent each. Whatever the advantages might be of private education, it is rare for most children, especially those from disadvantaged backgrounds. In fact, the number and share of students enrolled in private schools has fallen since the 1997-1998 school year, when it was 11 percent.

For each school, multiple test scores are reported across grades, subjects, and for various years. For this analysis, a single score was calculated for each school. The first step was to keep only observations from the latest year of data. For two-thirds of schools, this was 2011, and for 90 percent, it was 2011 or 2010.[4] The next step adjusted for specific test characteristics by calculating the average difference between the state proficiency rate and the school proficiency rate for the given grade and subject. As the formula below shows, this yields an average state-adjusted-test score

for each school. Here P is the percentage of students scoring at or above proficiency on the state exam, and $\bar{P}$ is the state average proficiency rate. The subscript *i* denotes the school, *s* the state, *t* the subject, *g* the grade level, and *y* the year the exam was administered.

$$A1.\ Average\ State\ Adjusted\ School\ Test\ Score_s = \frac{1}{n}\sum_{S_n}^{n}(P_{i,s,t,g,y} - \bar{P}_{s,t,g,y})$$

This state adjusted score includes a grade effect, a subject effect, year effect, and a state effect, which should mitigate much of the bias from comparing schools. One caveat is that many states were missing grade level observations, meaning that their schools were compared only to the state and subjects averages for that year.

The analysis also calculates national and metropolitan level indicators of the level and distribution of school performance by aggregating school level data. School specific data on enrollment by race and eligibility to receive free or reduced price lunches (an indicator of poverty or low income), student-teacher ratios, and school district spending were downloaded from the NCES's 2009-2010 Common Core of Data (the latest available) and matched to the test scores using the identification numbers provided by GreatSchools and the NCES. At the national and metropolitan levels, sample weights were constructed based on the share of students at each school, and those weights were applied to the data to calculate attendance by quality for the average student and by group (using group specific weights in that case).

The school test-score gap is defined as the difference in percentile ranking (on a scale of 1-100) for the average school attended by two different groups of students. For the metro test score gap, each state adjusted score is ranked against all other schools in the metro. In online data, schools are also ranked against all other schools in the nation to facilitate cross-metro comparisons.

For national and metropolitan summary data, the school test score gap is reported using data on all public schools. For parts of the analysis that compare the test score gap to housing costs, the test score gap is calculated only for the 48,008 schools in which a majority of students are enrolled in elementary grades (i.e., kindergarten to fifth grade), since that is the universe for the housing calculation—as described below.

Supplementing NCES Data

The NCES, which is part of the U.S. Department of Education, receives data from state government agency officials. Yet, the NCES data does not always match publicly available data from state education departments. When analyzing the NCES data, Brookings found a number of errors that ranged from important to trivial. They were of two kinds: missing lunch program data, when that data is reported for the school by state agencies; and schools reported as having zero lunch program eligible students, when state data says otherwise.

To the first problem, 32 percent of public schools in New York state included in this sample had missing lunch status data—meaning that schools did not report how many children were eligible for free or reduced price lunches, even though they reported total enrollment. No other state was missing lunch program observations for more than 5 percent of students. For five large metropolitan areas—New York City, Richmond, and Chicago, more than five percent of students could not be identified by lunch status, with New York City being by far the highest, with 38 percent).

To the second problem, Alaska, Illinois, Ohio, and Texas reported having a very high percentage of schools in which zero students were reported as being eligible for free or reduced lunch (above 5 percent) relative to other states (in 35 states it is less than 0.5 percent).

Since Alaska does not have any of the 100 largest metropolitan areas, data quality issues were not investigated for those schools, but for New York, Virginia, Illinois, Ohio, and Texas, state resources were consulted to correct potential errors. Schools in the state downloads were matched to the larger national database using phone numbers, principal names, and school names combined with either counties or other unique indentifying information.

School level information for New York on national lunch program status was downloaded from the New York State Education Department.[5] The author was able to replace 998 missing school-level observations regarding students eligible for free or reduced lunch. This identified roughly 579,000 extra low-income students, which were added to the database. Virginia was also missing a small number of observations, especially in the Richmond metro area, but only one replacement could be found with non-missing data. In that case, lunch eligibility enrollment data was obtained from the Virginia Department of Education.[6]

NCES data on eligibility for free or reduced price lunch status is reported with a large error for the state of Texas. The reason seems to be that Texas schools use an alternative indicator they call “economically disadvantaged” and so many schools do not report free or reduced price lunch status separately (or rather report it as zero). For example, 369 schools report having no free or reduced lunch eligible students (with roughly half from Hidalgo County, the McAllen metropolitan area, one of the poorest in the country). By comparison, only four schools in California report zero reduced price lunch students. In Texas, all students eligible for free or reduced price lunches are deemed economically disadvantaged; also included are students eligible for other poverty programs.[7] Student data on this low-income indicator is available for each school from the Texas Education Agency’s (TEA) Academic Excellence Indicator System. These TEA data were used to replace low-income enrollment data for 2,491 Texas schools. Free and reduced lunch specific enrollment was replaced as missing for schools reporting zero students in the NCES, since it was not available from the TEA. Finally, total enrollment from the TEA replaced total enrollment from the NCES for 12 schools.

Similar changes were made to school data in Ohio and Illinois. For Ohio, 3039 schools were reclassified with the appropriate state value from the Ohio Department of Education (30 of which had reported no eligible students).[8] For Illinois, NCES data for 397 schools on lunch eligibility was replaced with from the state of Illinois (replacing 247 schools reported as having no eligible students).[9]

Location and Housing Costs

In the absence of data on actual attendance zones boundaries for every school in the United States, hypothetical attendance zones are created using census tracts. The first step uses GIS to assign every census tract to all schools within a ten mile radius. Geographic coordinates and enrollment by grade level for schools are obtained from the NCES. Only schools that have at least 50 percent of their students in enrolled in elementary school (kindergarten through fifth grade) are included. This is done to avoid cases where students attend schools further away from residence, as is likely to be the case for schools that are strictly for middle or secondary students.

The next step is to calculate the distance between the school and (centroids of) the census tracts located within the ten mile radius. This is done based on longitude and latitude of both schools and tract using the *Vincenty* program written for STATA. For each census tract, school enrollment data was used to assign a weight for the tract between 0 and 100 percent that would be equal to the tract's contribution to total enrollment in the school. Starting with the nearest census tract and radiating outwards, housing costs for a tract were "assigned" to a school until cumulative tract enrollment equaled school enrollment. When tract enrollment shares pushed cumulative enrollment shares from below one to above one, only the fraction of students that would bring the total to 100 percent were included, and the tract weight was adjusted accordingly. The last step calculates a weighted average of housing prices using tract enrollment shares as the weight.

This method has the advantage of creating a natural attendance boundary around each school based on the student population surrounding it. It is limited to some extent by census tract boundaries, which are needed in the absence of actual housing cost data for each family unit. The analysis allows schools nearby one another to have overlapping attendance boundaries and, therefore, identical or nearly identical housing costs, depending on distance to surrounding tracts. This gives it a natural relationship to the school district's housing stock, even as actual attendance boundaries can be gerrymandered from year to year for administrative or political purposes.

Enrollment Segregation

Enrollment segregation captures how evenly students from disadvantaged backgrounds are enrolled across zip codes. The purpose of this index is to examine the correlation between school test-score gap and neighborhood sorting into schools. The calculation uses the dissimilarity index, which is described on the Census Bureau website.[10] In this

case, the index refers to the percentage of low-income students that would have to switch the zip code of their school with middle/high-income students to attain equal percentages of enrollment across all zip codes in a metropolitan area. The index is also calculated for black-white segregation and Hispanic-white segregation. To the extent that ZIP codes do not determine school enrollment, this index measures school segregation based on parental or administrative sorting; to the extent that ZIP codes dictate enrollment, it measures residential segregation. Thus it makes no assumptions about how students are assigned administratively.

Data on Zoning

The only recent survey known to the author at this time that takes a representative survey of jurisdictions within metropolitan areas was conducted by Rolf Pendall in 2003. The results were analyzed and reported in a Brookings publication with Robert Puentes in 2006.[11] Using this database, recent academic publications have found that zoning restrictions on density cause higher levels of racial segregation and higher housing prices at the metropolitan level.[12] The database is described in detail in those publications.

The analysis above uses the Pendall database on zoning to measure density restrictions at the metropolitan scale. The main survey question used here is: "What is the maximum number of units allowed in the jurisdiction per acre of land?" This was available for 1,677 local governments in 50 of the largest metropolitan areas in the United States, as of 2000. The local measures were aggregated to metropolitan areas, since the survey sample was designed to be representative of local governments in those areas. Although the survey was taken in 2003, academic work finds that zoning restrictions tend to stay relatively constant over 10 year periods and respond historically to changes in metropolitan population density.[13]

To get a larger sample of zoning for states and metropolitan areas, an alternative index of zoning was calculated based on the share of law firms in the state that specialize in zoning laws. This was done, as described above, using lawyers.com. For each state, the number of law firms with zoning specialists was divided by the total number of law firms. Each school level observation was assigned a news index zoning score based on its state. Metropolitan measures took the average score for each of its schools, such that metros that cross state lines were given a blended index. This index was highly correlated with the Pendall measure for the 49 metropolitan areas in which they overlapped (correlation coefficient of 0.57).

This index shows that Connecticut, Rhode Island, New Hampshire, and New Jersey are the most restrictive states, each being roughly two standard deviations above the mean. For New Jersey, especially, this seems reasonably accurate given the contentious state Supreme Court history on zoning and a historical analysis from academics.[14] Likewise, Massachusetts and Pennsylvania score highly (more than one standard deviation above the mean), which conforms to research on zoning in those states.[15] Yet, high values for

Idaho, Utah, and Hawaii may indicate that the index is picking up non-exclusionary zoning (see below).

The zoning law firm index is highly correlated with year of statehood and the number of rural housing units as a share of land area (rural housing density). This is consistent with the idea that urbanization during the late 19th and early 20th century led to the settlement of rural jurisdictions, as affluent residents fled cities to gain more autonomy over local government affairs.[16]

Finally, the zoning law firm index is interpreted here to proxy exclusionary zoning. There are two pieces of empirical evidence to support that interpretation. One, it is highly correlated with the Pendall survey measure of anti-density zoning, as noted above. Second, it is highly correlated with a newspaper index of exclusionary zoning created for each state and assigned to metros using Proquest. From 1975 to January of 2012, Proquest news archives were searched separately for each state using the key words "zoning" and "exclusionary zoning." The results were deflated by instances of the word January and July (averaged together). For the 100 largest metropolitan areas, the zoning law firm index is more highly correlated with the exclusionary zoning index than the generic zoning index. Moreover, the generic index is only weakly correlated with the Pendall measure (.17), while the "exclusionary" news index is highly correlated with it (.40).

Aggregated measures lose some of the local detail and introduce error. To provide that detail, two other surveys were used. One was a nationally representative survey of local governments conducted by scholars at the Wharton School at the University of Pennsylvania. It is described in the methods section above. To link this database to the variables used in the report, schools—with accompanying data for housing costs, enrollment, test scores, and metropolitan areas—were assigned to the places (e.g. town, cities, etc) with zoning data in the Wharton database, using place names and states.

Finally, regulatory data was downloaded from a 2004 study of housing regulations in Massachusetts by the Pioneer Institute and Rappaport Institute.[17] For researchers wishing to replicate the analysis in Massachusetts, here are details of how the index was constructed. To measure zoning, the percentile rank of four variables related to restrictions on density were averaged to get one index. These variables included a measure of the minimum lot size required for any housing developed under the most flexible cluster rules. The average was 8,370 square feet. A dummy variable was created if the town either does not permit multi-family housing or allows it only by special permit, or special permit within a more flexible cluster zone. 62 percent of towns met these criteria. Another variable was the longest frontage requirements in the town for single family housing—a measure of orientation towards expensive homes. 161 feet was the average, with 300 the maximum. Finally, combining two variables, the author calculated the percentage of zoning districts in the town that require at least 150 feet in front of the housing unit. A high number on this measure indicates zoning that blocks

affordable housing. The average was 43 percent. For details, see the codebook provided by the Pioneer Institute website.[18]

To assign schools—along with enrollment data, test scores, and housing costs—to the towns listed in the Massachusetts database, the first step to match town names to a crosswalk between towns and zip codes, provided by Moody's Economy.com. Then schools were assigned to towns based on their zip codes. This was done instead of directly linking town names to schools because of the idiosyncratic spellings of Massachusetts municipalities, townships, and villages, which differ across databases.

Regression Results

In the section on metropolitan areas measures of zoning and housing prices, the tables and figures imply that more restrictive exclusionary zoning is associated with high housing cost to live near good schools compared to bad schools (measured by test score performance). That analysis is described below.

In equation (2), the dependent variable, R, is the ratio of housing costs in the average neighborhood of top-quintile schools to housing costs in the average neighborhood of bottom-quintile schools. Z stands for zoning, and M is a vector of these metropolitan level variables: median household income, the Bachelor's degree or higher educational attainment rate, household income inequality (measured with the Gini coefficient), the share of the population that is black or Hispanic, the log of the population density and a dummy variable if the MSA is one of the 100 largest (i.e. it has a population above 500,000, roughly). ϵ is an error term that is correlated within states areas, since state constitutions and histories affect zoning differently. The regression to be estimated is

$$(2)\ R_m = \beta_1(Z_m) + \beta_2(M_m) + \epsilon_s$$

This looks at the correlation between zoning and housing premium, holding other factors constant. The data is summarized in Appendix Table 1 and the results are shown in Appendix Table 2, both below.

Appendix Table 1. Summary Statistics of Main Variables

Variable	Obs	Mean	Std. Dev.	Min	Max	Source of data
Housing costs in tract of top-quintile school/bottom quintile	347	1.79	0.54	0.59	3.54	U.S. Census, ACS 2005–2009
Standardized Index of Anti-density zoning	49	0.00	1.00	-1.89	1.79	Pendall survey, 2003
Standardized Index of zoning law firms per law firm	347	-0.09	0.94	-1.63	3.26	Lawyers.com
MSA Median household income (in thous)	347	47.02	8.12	31.74	84.52	2010 Census
MSA household income inequality (Gini coefficient)	347	0.45	0.02	0.39	0.54	Census, two-year 2008–2010 ACS
MSA black and Hispanic share of population	347	0.22	0.16	0.01	0.94	Census, 3-year 2007–2009 ACS
MSA population density (per sq miles of land)	347	298	332	7	2826	2010 Census
MSA Bachelor's Degree attainment rate, 2010	347	0.26	0.08	0.11	0.58	2010 Census
Binary variably for one of the 100 largest MSAs	347	0.29	0.45	0.00	1.00	2010 Census
Elementary school test score gap*	347	20.0	7.5	-4.6	37.8	GreatSchools and NCES
Year of Statehood (primary city)	347	1829	36	1787	1959	U.S. Mint

*Note: This variable compares schools attended by low-income students to middle/high-income students. “Low-income” here refers to students eligible for either free or reduced price lunch; middle/high-income refers to students who are not eligible for either program.

Appendix Table 2. Regression of metropolitan zoning on housing cost gap

	Housing cost gap	
	1	2
Pendall measure of anti-density zoning	0.170**	
	(0.0661)	
Zoning law firm index		0.0811**
		(0.0360)
Median household income in thousands, 2010	0.00523	0.00950
	(0.0203)	(0.00667)
MSA household income Gini coefficient, 2008–2010	4.596	5.500***
	(5.784)	(1.280)
MSA black and Hispanic share of population, 2007–2009	0.568	0.579**
	(0.538)	(0.234)
MSA population density in 2010	0.000166	0.000180*
	(0.000108)	(0.000105)
Bachelor's degree or higher attainment rate, 2010	-2.107	-0.459
	(2.983)	(0.466)
100 largest metropolitan area		0.378***
		(0.0803)
Constant	0.377	-1.282*
	(2.650)	(0.678)
Observations	49	347
Adjusted R-squared	0.264	0.347

Robust standard errors in parentheses, clustered on states. *** p<0.01, ** p<0.05, * p<0.1

To calculate the effect on the housing cost gap of changing zoning from one extreme to another, the range of zoning is multiplied by the regression coefficient from Appendix Table 2. The range equals 3.68 using the Pendall data and 4.92 using the zoning law firm index. The product yields .63 and .40, respectively.

Given the theory outlined above, one needs to consider not only how zoning affects housing costs, but whether or not it affects inequality in schooling. The argument is that exclusionary zoning siphons poor children into poor neighborhoods with low-performing schools, and affluent children into affluent neighborhoods with high-performing schools. One may test this directly is to use zoning as an instrument for the housing premium in order to test the causal effect of the housing premium on school inequality.

Zoning is a valid instrument if it meets the two conditions that it strongly predicts the housing premium and that there is no way for it to affect school inequality, except through its effect on the housing premium, which is itself a measure of economic segregation. There is no way to definitely prove the second criteria, but it is difficult to imagine how the disproportionate presence of zoning lawyers could cause differences in access to schooling if not by indicating more exclusionary zoning. Fortunately, one can add a second instrumental variable and use the Hansen-J statistic to test if the equation is over-identified (meaning the instruments are invalid). This second instrument indicates the degree of rural settlements and is measured by dividing the number of rural housing units in the metropolitan area by total metropolitan land area. One can think of it as an alternative measure of zoning, and the two are highly correlated. If rural

settlements are disproportionately common in a large metropolitan area, then it is likely because zoning has shaped the landscape accordingly by isolating rural suburbs from urban development.

Assuming the assumptions are valid, the equation would look like this:

$$(3)\ S_m = \beta_1(\bar{R}_m) + \beta_2(M_m) + \epsilon_m$$

Here, S stands for the difference in school performance for the average low-income and middle/high-income student. R hat is the housing premium, instrumented with zoning as in equation (2) and M is the same vector of control variables from equation (2).

These results are reported in Appendix Table 3. As predicted, the housing premium is strongly associated with greater school inequality, and if zoning is a valid instrument, the results can be interpreted causally.

Appendix Table 3. 2SLS Regression of housing cost gap from zoning on school test-score gap

	Test-score gap, elementary	Test-score gap, all schools
	1	2
Instrumented: Housing costs top quintile schools/bottom quintile	9.143**	18.79***
	(4.152)	(5.843)
Median household income in thousands	0.196*	0.0223
	(0.101)	(0.123)
MSA household income Gini coefficient	20.28	-43.25
	(32.18)	(39.77)
MSA black and Hispanic share of population	2.793	-3.079
	(3.179)	(3.743)
MSA population in millions, 2010	-8.71e-05	-0.00222
	(0.00145)	(0.00205)
Bachelor's degree or higher attainment rate, 2010	3.424	11.81
	(7.945)	(8.821)
100 largest metropolitan area	1.358	-1.201
	(1.630)	(2.202)
Constant	-16.49	-1.321
	(12.13)	(14.50)
Observations	347	347
Anderson-cannon coefficient	10.4	10.4
Hansen-J	0.28	0.58
R-squared	0.55	0.10

Robust standard errors in parentheses, clustered on states. *** p<0.01, ** p<0.05, * p<0.1. Instrument is the zoning law firm index and the number of rural housing units per acre of total MSA land in 2010.

In order to predict how changing zoning could change the school test-score gap, the same thought experiment from above can be conducted above. From the previous set

of regressions, the effect of moving from an extremely restrictive state's zoning laws to a state with minimal zoning laws yields a reduction in the housing cost gap of approximately 0.40 points. This effect size can be multiplied by 9.1 (the coefficient on zoning in column 1 of Appendix Table 4) and 18.8 (the coefficient on zoning in column 2) to obtain an estimated effect that ranges from -4 to 7 on the test score gap, depending on whether one looks at only elementary schools or all schools.

In results not shown, the year of statehood and the number of rural housing units in the metropolitan area per acre of land were used as instruments for the zoning law firm index in a regression of zoning on the housing cost gap, controlling for the same variables used in Appendix Table 1. The relationship is statistically significant and the coefficient on zoning increased to 0.43—implying that a change in zoning could cause a reduction in the housing cost gap of 1.6 percentage points, which is almost enough to eliminate the test score gap. Moreover, the instruments pass the necessary validity tests: they strongly predict zoning (Anderson coefficient has a p-value of 0.0) and the Hansen J-statistic over-identification test suggests that they are exogenous (p-value of .20). This implies that the results shown in Appendix Table 2 are biased towards finding no relationship between zoning and the housing gap. This could be the case if state or local government policies counteract some of zoning's exclusionary effect with inclusionary policies, perhaps as a result of political pressure or state court rulings.

The correlation between state of birth and zoning is -0.44 for 49 states with metropolitan areas in the sample. Older states had more time to settle and urbanize, and hence suburbanize and set up exclusionary zoning in the 1920s. Previous research by the author finds that 1920s population density is a very strong predictor of zoning today.[19] This does not prove that zoning causes large housing premiums near good schools or that zoning causes school segregation, but it is difficult to think of other plausible explanations for these associations.

Metropolitan Test Scores and Individual Labor Market Outcomes

In the main report, at the end of the first finding in the report, the analysis addresses the following question: Does the performance of public schools attended by minority groups affect their probability of employment, college education, or wages?

The literature cited in the background section suggests that the answer is yes, but it is possible that schools make such a small difference that it does not show up in aggregated data. To look for evidence either way, the analysis compares the outcomes mentioned above for young individual blacks and Latinos living in different metropolitan areas. The idea is that recent graduates from the school system are the most likely to have been affected by it, and that young people are less likely to have switched metropolitan areas since high school than middle-aged adults.

The individual data come from the 2010 American Community Survey as provided by the Integrated Public Use Microdata Series (IPUMS).[20] To make individuals comparable, the analysis adjusts outcomes for observable characteristics that might

otherwise bias the results: family income, age, sex, age of immigration to the United States (if foreign-born), whether or not he or she moved states since birth, marital status, disability status, and number of children. Since metros differ by more than just school performance, metropolitan area variables were included to control for school performance for the average white student, the share of the population aged 25 and older with a Bachelor's degree or higher, the unemployment rate in 2010, the population size, the years of education required by the average job, and the share of residents from the ethnic group in question. Those data were calculated from the U.S. Census Bureau by Brookings. Family income was calculated by subtracting individual income from total family income. For both Latinos and blacks, the sample was limited to data on roughly 22,000 to 32,000 individuals who have lived in the United States since the age of 13 or younger and are currently between the ages of 18 and 25. All results apply sample weights from the Census Bureau.

Appendix Table 4 shows the results from six regressions of metropolitan level test scores on individual outcomes for black or Latino young adults aged 18 to 25. Specifically, the regression looks at how average state-adjusted test scores (ranked against all schools) for the average school attended by blacks (or Latinos) are correlated with economic outcomes for young-adult blacks (or Latinos). To isolate the effects of test scores from the effects of living in a highly-educated metro, the results also adjust for school test scores for the average white student. These results were used to predict the summary statistics displayed in Table 4 in the main body of the report by calculating the predicted effect of living in the metro with the lowest test scores to the effect of living in the metro with the highest test scores.

The results are very strong for blacks. On all indicators—income, post-secondary attendance, and employment—blacks do better if they live in metros with better test scores. Since the analysis adjusts for family income, it is difficult to dismiss these findings as stemming from any obvious selection bias (i.e. more economically successful black families living in metros with better test scores for blacks). The results for Latinos are very similar, except the probability of post-secondary school attendance is not significantly correlated with metro test scores.

Still, caveats are needed. As stated in the endnotes of the manuscript, this analysis cannot definitely conclude that schools are the cause of the better economic outcomes, since individuals who live in higher-scoring metropolitan areas may have unmeasured advantages.

Appendix Table 4. Regression of individual labor market outcomes on MSA measures of school performance

	Earnings		Attained some college or higher education		Employed or in school	
	Blacks	Latino	Blacks	Latino	Blacks	Latino
	1	2	3	4	5	6
Percentile rank of average black student's elementary school	60.98**		0.00175**		0.00172**	
	(23.47)		(0.000774)		(0.000707)	
MSA Black Share of population, 2007–2009	1,441		-0.129*		-0.0607	
	(1,780)		(0.0749)		(0.0650)	
Percentile rank of average Hispanic student's elementary school		71.31**		0.00117		0.00239***
		(31.55)		(0.00169)		(0.000543)
MSA Hispanic share of population, 2007–2009		-1,382*		0.148***		0.0556***
		(813.5)		(0.0470)		(0.0175)
Percentile rank of average white student's elementary school	-88.26**	-67.24*	-0.00260*	-0.00259	-0.00341***	-0.00215***
	(33.72)	(38.95)	(0.00140)	(0.00213)	(0.000917)	(0.000814)
Family income	-0.0120***	-0.00837***	1.28e-06***	8.69e-07***	2.25e-07***	1.96e-07***
	(0.00271)	(0.00240)	(1.01e-07)	(7.57e-08)	(8.30e-08)	(4.00e-08)
Sex	351.3*	-1,641***	0.146***	0.122***	0.0715***	0.0543***
	(195.2)	(179.7)	(0.00861)	(0.00832)	(0.00752)	(0.00362)
Age 18	-14,959***	-17,182***	-0.448***	-0.393***	-0.0265**	-0.0662***
	(717.5)	(629.1)	(0.00835)	(0.0150)	(0.0122)	(0.0105)
Age 19	-13,451***	-14,759***	-0.241***	-0.197***	-0.0842***	-0.0750***
	(714.0)	(653.7)	(0.0134)	(0.0167)	(0.0160)	(0.0110)
Age 20	-11,193***	-12,323***	-0.142***	-0.131***	-0.0770***	-0.0598***
	(798.2)	(686.2)	(0.0122)	(0.0131)	(0.0177)	(0.0102)
Age 21	-9,959***	-10,176***	-0.117***	-0.0988***	-0.0725***	-0.0607***
	(715.0)	(693.6)	(0.0183)	(0.0155)	(0.0154)	(0.00903)
Age 22	-7,794***	-8,143***	-0.0886***	-0.0758***	-0.0514***	-0.0444***
	(584.2)	(681.1)	(0.0146)	(0.0120)	(0.0155)	(0.00864)
Age 23	-5,767***	-6,525***	-0.0431***	-0.0539***	-0.0196	-0.0379***
	(606.6)	(621.6)	(0.0140)	(0.0125)	(0.0131)	(0.0100)
Age 24	-4,138***	-4,300***	-0.0347**	-0.0163*	-0.0324**	-0.0186*
	(523.4)	(558.2)	(0.0148)	(0.00908)	(0.0139)	(0.00994)
Year immigrated to the USA X Foreign-Born status	-0.729*	-0.219**	1.78e-05	-6.75e-05***	1.42e-05*	8.59e-06***
	(0.376)	(0.0948)	(1.42e-05)	(6.35e-06)	(8.49e-06)	(3.29e-06)
Born in state of residence	-1,988***		-0.0952***	-0.0455***	-0.0268***	-0.00884
	(406.9)		(0.0100)	(0.00780)	(0.00888)	(0.00638)
MSA share of population aged 25 and older with Bachelor's or higher	-5,863	14,264***	-0.343	0.00667	-0.309	0.212***
	(7,018)	(4,870)	(0.261)	(0.257)	(0.212)	(0.0810)
MSA 2010 unemployment rate	-260.5**	-107.7	0.000843	-0.00558	-0.0203***	-0.00766***
	(115.3)	(90.89)	(0.00321)	(0.00425)	(0.00336)	(0.00207)
MSA Population	1.07e-05	1.07e-05	3.16e-09***	2.00e-09	3.82e-09***	1.28e-09**
	(2.41e-05)	(2.42e-05)	(8.84e-10)	(1.73e-09)	(7.97e-10)	(5.30e-10)
Years of Education Demanded by Average Occupation in MSA	6,574**	-4,348	0.233**	0.178*	0.0355	-0.0632**
	(2,967)	(2,821)	(0.107)	(0.105)	(0.0736)	(0.0318)
Number of own children in the household	-1,150***	-1,629***	-0.0820***	-0.120***	-0.0381***	-0.0320***
	(176.5)	(147.2)	(0.00597)	(0.00680)	(0.00534)	(0.00352)
Wife	-3,567***	-6,889***	0.0270	-0.0321*	2.88e-05	-0.105***
	(1,286)	(609.4)	(0.0314)	(0.0195)	(0.0276)	(0.0184)

Married	5,480***	7,349***	0.0343*	0.00687	0.0552***	0.0784***
	(1,039)	(509.2)	(0.0192)	(0.0195)	(0.0193)	(0.00737)
Has disability (cognitive or ambulatory)	-5,406***	-6,714***	-0.271***	-0.233***	-0.0858***	-0.0680***
	(219.5)	(319.3)	(0.0175)	(0.0134)	(0.0190)	(0.0153)
Constant	-63,921*	79,595**				
	(37,807)	(36,753)				
observed probability			0.48	0.46	0.75	0.83
predicted probability			0.47	0.45	0.75	0.84
Observations	21,662	32,406	21,662	32,406	18,928	28,679
Adjusted R-squared	0.157	0.193				

Robust standard errors in parentheses, clustered on metropolitan areas. *** p<0.01, ** p<0.05, * p<0.1. Columns 1-2 use OLS and columns 3-6 use probit

[1] GreatSchools, available at www.GreatSchools.org. (January 2012).
[2] It was unclear why some schools did not have data, but they were smaller and more likely to be irregular. Of those missing test score data, only 54 percent were "regular" schools, meaning not alternative, not vocational, or not special-ed. This compared to 96 percent of all schools in the database. The regular schools without test score data were also smaller, with average enrollment of 250 students, compared to 556 students for schools with test data.
[3] Hastings and Weinstein, "Information, School Choice, and Academic Achievement."
[4] For a very small percentage of schools, the latest year of data was from 2006 or 2007—0.18 percent total; for all others it was 2008 or later as described in the text above.
[5] New York State Education Department, available at https://reportcards.nysed.gov/databasedownload.php (April 2012).
[6] Virginia Department of Education, available at http://www.doe.virginia.gov/support/nutrition/statistics/index.shtml (April 2012).
[7] Texas Education Agency definition of economically disadvantaged students, available at http://ritter.tea.state.tx.us/cgi/sas/broker (March 2012).
[8] Ohio Department of Education, available at http://ilrc.ode.state.oh.us/Downloads.asp (April 2012).
[9] Illinois State Board of Education, available at http://www.isbe.state.il.us/research/htmls/fall_housing.htm (April 2012).
[10] U.S. Census Bureau; Housing Patterns, definitions of segregation, available at http://www.census.gov/hhes/www/housing/housing_patterns/app_b.html (January 2012).
[11] Rolf Pendall, Robert Puentes, and Jonathan Martin, "From Traditional to Reformed: A Review of the Land Use Regulations in the Nation's 50 Largest Metropolitan Areas," (Washington: The Brookings Institution, 2006).
[12] Rolf Pendall, "Local Land Use Regulation and the Chain of Exclusion" *Journal of the American Planning Association* 66 (2) (2000):125-142; Douglas S. Massey, Jonathan Rothwell, and Thurston Domina, "The Changing Bases of Segregation in the United States" *The Annals of the American Academy of Political and Social Science* 629 (1) (2009): 74-90; Jonathan Rothwell and Douglass S. Massey, "The Effect of Density Zoning on Racial Segregation in U.S. Urban Areas," *Urban Affairs Review* 44 (6) (2009): 779-806; Jonathan Rothwell "Racial Enclaves and Density Zoning: The Institutionalized Segregation of Racial Minorities in the United States," *American Law and Economics Review* 13 (1) (2011): 290-358; Jonathan Rothwell, "Density Regulation and Metropolitan Housing Markets," Working Paper 1154146 (Social Science Research Network, 2009).
[13] Rothwell and Massey, "The Effect of Density Zoning on Racial Segregation in U.S. Urban Areas."
[14] Southern Burlington County NAACP v. Township of Mount Laurel, 336, A. 2d 713 [N.J. 1975]; Norman Williams Jr. and Thomas Norman, "Exclusionary Land Use Controls: The Case of North-Eastern New Jersey," *Syracuse Law Review* (1970-1971): 475-507.
[15] Glaeser and Ward, "The Causes and Consequences of Land Use Regulation"; Mitchell, "Will empowering developers to challenge exclusionary zoning increase suburban housing choice?"
[16] Rothwell "Racial Enclaves and Density Zoning"
[17] Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston. 2005. *Massachusetts Housing Regulation Database*. Prepared by Amy Dain and Jenny Schuetz.

[18]Housing Regulation Database, available at http://www.masshousingregulations.com/dataandreports.asp (January 2012).
[19] Rothwell "Racial Enclaves and Density Zoning: The Institutionalized Segregation of Racial Minorities in the United States."
[20] Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. Integrated Public Use Microdata Series: Version 5.0 [Machine-readable database]. Minneapolis: University of Minnesota, 2010.